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ORIGINAL COMMUNICATIONS.

"A body of men engaged in the same pursuit, form a joint stock of their information and experience, and thereby put every individual in possession of the sum total acquired by them all."—REV. DR. WILLIAM CAREY.

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On Antidotes to Snake-Bites. By Captain MUNRO, F.L.S.

• THE subject of this paper must at all times, whether looked at in a selfish or in a philanthropical point of view, be interesting to persons resident in tropical countries. Where, from the abundance of noxious reptiles, it is impossible to say how soon an injury from one may call upon individuals either for themselves or their neighbours, to make use of such appliances as they know or have heard to be efficacious under similar circumstances.

The attention of Europeans however is more frequently called to the subject in some parts of India than in others,—venomous serpents in general, and Cobras (*Najas*) in particular, being in Hindoostan more prevalent, to the best of my belief, in dry rocky or uneven ground than in moist level places. In the moist plains of the Malayan Peninsula, Penang, and Singapore, the Cobra occurs as frequently as in the Hills, but not numerously in any of the three localities.

As far as my own experience, in hearing and seeing goes, I should say that Calcutta is more free from venomous snakes than any portion of India that I have visited. Indeed, this assertion is to some extent borne out by the statement of various Medical Officers who were requested to report upon the merits of the roots of *Cissampelos convolvulacea*, which had been sent to them for experiment in cases of snake-bites. Dr. Nicolson writes that, "he is not aware of a single case of snake-bite having been admitted into the General Hospital during the thirty years last past." Dr. Mouat states, "that no case had occurred in the Medical College Hospital." Dr. Jackson says, "we have very rarely a case of snake-bite brought into the Native Hospital, and that no opportunities had offered for trying the proposed remedy." He also adds, "The remedies I generally have recourse to are ammonia, laudanum, ligatures above the wound, and cupping to the part, and I have no reason to be dissatisfied with the success." Dr. Forsyth, as Secretary to the Medical Board, in forwarding these communications, recommends that a portion of the *Cissampelos* roots be sent to the Benares and Agra Divisions, for use, particularly at Gorruckpore and Agra, where snake wounds are more frequently met with than at any other locality in the Bengal Presidency. Both Mr. Marsden and Sir Stamford Raffles advert to the very rare occurrence of snake-bites in Sumatra. From May 1842 to September 1845 no case of snake-bite was admitted in the six Hospitals in Prince of Wales' Island, nor in a seventh in Province Wellesley, which were in the charge of Dr. Cantor: yet these localities are inhabited by at least nineteen species of venomous serpents. (Cat. of Malayan Reptiles in Journal Asiatic Society, 1847.)

In a service of twenty years in the Straits of Malacca, and during the latter twelve years of which, all medical reports of the three Settlements were made through Dr. Montgomerie, that officer states, that only one case (and that at Penang)

of venomous snake-bite came under his observation, and this did not terminate fatally. Venomous snakes would, however, appear to be very numerous at no great distance from Calcutta. Mr. Turner, Civil Surgeon at Midnapore, in forwarding a specimen of a supposed antidote in a plant, which proved to be *Achyranthes aspera*, (Willd.) *Chichiria* of the Bengallees, transmits (in proof of how much some antidote is required in his district,) a return signed by the Magistrate of the Zillah of Midnapore, shewing that during a period of twenty-one months (from January 1845 to October 1846), no less than 402 deaths had occurred in the zillah from snake-bites, of which number forty-six deaths occurred in the Thannah of Subbung, and forty in that of Kulmeejole, or about one every fortnight in each of these two Thannahs.

During my own travels in India, I have seen Cobras most numerous at and about Bangalore, in the Madras Presidency, then in the Neermul jungles, in Central India, and next at Agra.

• For many years past different remedies have been proposed in India, as infallible ones, by men, in several instances, entitled to full credit for carefulness in carrying on their experiments, and possessed of sufficient knowledge of the subject to render their assertions worthy of all belief and attention. Some of these remedies have however been tried by others equally capable of giving an opinion, and found to fail.

There seems to be a prevalent idea, among Medical men especially, that there is no specific, particularly in the vegetable kingdom, against the bite of venomous snakes, and to such an extent did Fontana carry his prejudice, that on hearing of a cure effected in London, by Dr. Mead, of a man who was bitten by a rattlesnake, he said, “the rattlesnake might have been destitute of venom; it might have bitten superficially, and so ill, that the poison introduced was not in sufficient quantity to occasion death; a vein or artery torn

by its tooth might have forced out all the poison or a part of it." Such reasoning could only come from a man determined not to be convinced.

The wiser plan surely is to be prepared in case of necessity with such means as have well been recommended. When we know of such powerful vegetable products as *manchineel*, *hemlock*, *aconite*, *opium*, *Nux-vomica*, *upas* or *untjar*, *tanghinia*, *henbane*, *datura*, *belladonna*, and *croton*, with many others, I think we may without encouraging any very chimerical notions, fairly hope to find some specific amongst vegetables even against the direful and sudden effects produced by snake-bites.

Mr. Waller, the translator of M. Orfila's Toxicology, in the preface to the work—writes, "the labours of MM. Pelletier, Caventon, and Magendie, by their skilful analysis of many vegetable substances, have brought to light new and unknown principles of astonishing energy for the most part of alkaline bases," and adds, "we may thus, in cases of poisoning, look for many powerful and energetic remedies in the vegetable kingdom."

Without mentioning the various remedies suggested in the chronological order of their publication, I shall in the first place refer to a few plants more recently brought to the notice of the Agri-Horticultural Society.

In June 1844, Colonel Cox, a frequent contributor of useful vegetable products, writes from Calpee thus: "I send a specimen of a climbing plant found in the Dooab, near Allahabad, which has proved in repeated trials a complete specific for the bites of the most venomous snakes, the Cobra de Capello included. A small piece of the root, about an inch long, is bruised down with about twenty black peppercorns, and given in a little water to the patient. It causes profuse foaming at the mouth, and the dose is to be repeated at short intervals, two or three times. The patient is to be kept in active bodily motion till all symptoms of lethargy are

removed. The native name is *Kupoorree* and *Purhee*—it is however but little known among them. I got the specimen I send, and the information from Mr. A. Matthews, at Allahabad, who, has often used it at his factories with complete success.”

The plant was referred to Dr. Griffith, who found it to be “*Cissampelos convolvulacea*, W. and A. ; natural family *Menispermæ*, which, contains plants with febrifuge and narcotic qualities, of the former *Galancha* is an example, of the latter *Cocculus indicus*, to which brewers and fish can testify.” Dr. Griffith adds, “I am most sceptical on the point of specifics against snake-bites.”

However, I think we may safely look in this family (*Menispermæ*) for a specific. Many of the plants composing it are extensively used in medicine, and some are possessed of excessively active, narcotic, and bitter qualities. The Columbo root, belonging to the order, has powerful antiseptic, tonic, and astringent properties. *Cocculus acuminatus*, D. C., *Menispermum polycarpon* of Roxb. is mentioned by the latter, but not with much confidence, as a specific against snake-bites. This plant is growing against several of the trees in the Barrackpore Park, and I have seen it a large creeper on the rocks at Colgong. Two plants of the same genus as that to which Colonel Cox’s plant belongs, *Cissampelos glaberrima* and *ebracteata* of St. Hilaire, are used by the Brazilians in cases of snake-bites, as also, according to Piso, the juice of a third species, *C. Pareira* (*Pareira Brava*). Surely such a coincidence as to reputed properties in three plants of one genus ought to carry some weight with it. Dr. Lindley also states, that Medical men in all the countries where the order is found believe in the powerful nature of its roots.

Dr. Griffith suggested, that a quantity of the roots should be sent to Calcutta for trial, and Colonel Cox accordingly did so. It was on the utility of the roots forwarded by him

that the Medical officers were requested to report as mentioned in a previous page. .

In November 1846, Mr. Lowther sent down from Allahabad a leaf of a plant which he thought to be a species of *Aristolochia*, but differing from the species previously forwarded by him; and to which I will presently refer. This was sent to me, and I perceived it to be identical with Colonel Cox's plant. Mr. L. writes: "the powdered root has been administered in snake-bites with the most decided success. Mr. G. Matthews, who resides at a factory 20 miles from Allahabad, informs me, he was present during its exhibition in two desperate cases. Four cases were reported to Mr. Matthews in June and July last, in which the patients were cured by using the root." Thus the merits of the plant would appear to have been tested throughout a period of 2½ years at Allahabad, and found to be effective in the cases in which it was used. The plant is very common over most parts of India, and is abundant about Chinsurah. I am not aware of any native name by which the plant is known in this part of the country.

The next plant that I shall refer to is *Aristolochia indica*, regarding the virtues of which we have received such positive information from the most credible eye-witnesses, as must suffice to convince most persons of its efficacy in some cases of injury from the bite of a Cobra. I may as well observe here, that the Cobra de Capello or hooded-snake, especially when the hood is expanded, is so very distinct in appearance from all other snakes, that it is easily recognized again by persons who have once seen it, and very few, resident any time in India, have not seen, at least once, the exhibition of the snake charmers, with whom, the Cobra is the principal performer. With regard to varieties, Russell remarks, that he examined a score of supposed species of Cobra, and found the stated differences to be so trifling, and the venomous property so nearly equal in all, young and adult, (for the foetus

of all venomous serpents have venomous glands and fangs fully developed,) that he considered the whole twenty to be the same identical species.

But one hooded venomous serpent is known besides the Gen. *Naja*, which is the gigantic *Hamadryas* of Cantor. Therefore in cases of bites where the snake is seen, and declared to be the Cobra, we may feel far more convinced of the venomous nature of the reptile than we possibly could in the case of any other Indian snake. For of my own knowledge I am aware, that many snakes are declared by the natives to be mortally dangerous who are not furnished with the means of inflicting any serious injury. Of forty-three serpents described in the first part of Russell's Snakes of Coromandel, only seven were, by him, found to be provided with poisonous organs. We cannot doubt that in most cases the bite of the Cobra is fatal. I have myself witnessed death ensue in four cases which were not treated; and in two others I have seen persons cured who had suffered most acutely for several hours. In one fatal case at Bangalore, I saw a little child in a basket placed by its mother, who was working in the garden, under some small shrubs near some rows of peas. I passed by the spot in less than an hour afterwards and saw the child dead, with a Cobra close to the basket, which I immediately killed. It afterwards appeared that the child had been bitten in the face. From experiments made by Fontana and Russell, the latter states: "it is now beyond all doubt, that the stronger animals who resist the poison of the viper, rapidly give up life to the single bite of the Cobra."

But to return to the *Aristolochia indica*. In August 1846, Mr. Lowther introduced the plant to the notice of the Society in a letter, in which he says: "I have a vine-creeping plant in my garden, the leaves of which are a specific against the poison of snakes. It has been administered in very bad cases in numerous instances with complete success. I enclose a leaf of the medium size, and a few of the seeds. It grows

near nullahs, and is in flower now. The last time I tried it was in the case of a Sepoy's wife. The people had tried in vain to charm away the poison, and when the woman became insensible, her husband came over to my gardener to ask for some of the leaves. I sent three; they were reduced to a pulp with water, and poured into her mouth, and in half an hour she was quite well: at this time her jaw had dropped, and she was apparently in articulo mortis."

The leaf and seeds were sent to me, and I had no difficulty in recognizing them as belonging to *Aristolochia indica*, which I had very frequently seen in Southern India, but less frequently in the Upper Provinces. To the identification of the species I added a few remarks on the other species of *Aristolochia* which were forwarded to Mr. Lowther, and on the 6th November he furnished the Society with some very remarkable and encouraging facts as to the efficacy of the plant, in some cases witnessed by himself. Mr. L. writes thus: "Of the value of the leaf of the *Aristolochia indica*, I have had further proofs. My gardener has recently administered it in four desperate cases with perfect success, and it is a singular fact, that the Sepoy's wife, whose case I adverted to in my last letter, was one of them. She was again bitten by the same snake. In this instance her jaw was so firmly fixed, that they were obliged to force it open by the introduction of the handle of an iron ladle. She recovered in half an hour. The snake had taken up its abode in the wall of the house, and could not therefore be dug out without injuring the building. The Sepoy considered the destruction of the reptile of less consequence than the outlay of a few rupees. He has therefore adopted no other precaution than that of stopping the hole."

With regard to the above I must say, that this portion of the proof is by no means so convincing as that which follows. How was it possible to say that it was the same snake that bit the woman twice? And as Mr. L. does not appear to

have been present, it is just possible that his gardener may have been deceived to some extent. I only make these remarks with the view of meeting criticism on such points as are certainly open to doubt, and in the hope of strengthening the subject by dismissing from consideration all such statements as do not seem worthy of the most implicit credence. Mr. Lowther now adds the valuable testimony of his own experience. He says, "On the 5th of last month, I had the satisfaction of treating a case successfully in which life appeared to be quite extinct. A young woman was brought to my door on a charpoy at 9 o'clock at night, who was stated to have been bitten in the foot at 6 in the evening. The cold clammy sweat of death was upon her. Pulsation had entirely ceased, and my first impulse was to send the body away. I had heard from the gentleman who had given me the plant, that he had witnessed the cure of a woman by the mere external application of the bruised leaf, and the "*Zuhr Mohra*," a black stone used so commonly by the snake-catchers. Hopeless as the case was, I directed some bruised leaves to be rubbed over her forehead, and her nostrils plugged with it. In the course of five minutes I observed a slight quivering of the lip; her mouth was then forced open, and a portion of the juice of four pounded leaves entered her stomach involuntarily: a little after this she recovered the power of deglutition, and swallowed the remainder. She was immediately raised from the charpoy, and with the support of two of the bystanders, was enabled to stagger about. The conflict between the remedy and disease at this time was very distressing. When she was enabled to articulate, she complained that a fire was consuming her stomach, and begged for water, with which she was somewhat relieved. I then gave her another pounded leaf to make up for a small quantity which escaped from her mouth when lying on the charpoy. From this she experienced great relief, and a natural heat began to spread over the sur-

face of the body. She still complained of pain in the poisoned limb, which was well rubbed with the pounded leaf, and after keeping her in motion for an hour and a half, she returned home on foot perfectly restored. The case had been so desperate that I thought it advisable to caution the woman against falling asleep for some hours. Her husband however went beyond these instructions, for he not only kept her awake the whole of the night, but at 1 o'clock in the morning administered two additional leaves, which unknown to me, he had taken away: not that the woman had relapsed, but in order to make sure of the recovery. This caused an extreme sensation of giddiness, as well it might, from its stimulating effects. On hearing of this early in the morning, I sent her an ounce of castor-oil, and in the course of three hours she was quite well. I should mention that Lieut. McCarthy, of the 53rd N. I., was an eye-witness to this case, treated by me, and had no hope of success."

In taking into consideration the very curious and remarkable facts mentioned above, we must recollect that Mr. Lowther, having come to India in 1808, from a long residence, must be perfectly acquainted with the tricks of the natives, and not likely to be imposed upon in any way whatever, even if imposition could have been attempted in such a case.

Mr. Lowther gives another instance. "On the 1st instant an infant was brought to me in a comatose state, under the following circumstances. Its mother, whilst grinding meal, was bitten by a snake just behind the region of the heart. She informed the neighbours of the accident but they discredited her story, and told her it must have been a rat. It does not appear whether the snake was seen or not, but in a short time the poor woman complained of sickness, and as her child became fretful, it was put to the breast, and must clearly have been affected by the poison then in circulation: when it was brought to me it had the appearance of being

overdosed with opium. The skin was warm, but there was nothing beyond it to indicate animation.

“The mother had died under the fruitless attempt of the charmer about an hour before the child was brought to me. I caused its forehead to be well rubbed with the pounded leaf, and applied some of it to its nostrils. The mouth was opened with difficulty, and about a quarter of a small leaf bruised with water gradually poured down its throat. In the course of five minutes it groaned, and this was followed by a violent scream and eventual liveliness.”

What can be more remarkable than this? No instruction could have enabled the child to take a feigned part, and Mr. L. was witness to the whole case. The venomous nature of the reptile has been proved by the death of the mother. As to the transmission of poison in the natural secretions, Dr. Langsdorf, as quoted by Lindley, mentions a case in which the intoxicating qualities of a fungus, *Amanita muscaria*, were transmitted through the natural secretions of the body, to five different individuals consecutively, from the one to the other.

One great advantage attending the use of *Aristolochia indica* is, that the plant is generally known to the natives by the name of *Ishurmool*, and is very common in almost all parts of the country. Dr. Fleming, in the 11th volume of the Asiatic Researches, in describing the properties of several Indian medicinal plants, independently of their connection with snake-bites, names the *Aristolochia indica*, with the native name given above, as being a good emmenagogue and antarthritic with bitterness, and a considerable degree of aromatic warmth. Russell mentions the plant as much valued in Southern India as an antidote, but does not appear to have tried its virtues in any other way than by placing it with garlic in the track of a snake, to ascertain whether the reptile had any natural antipathy to either. It is with reference to this single experiment alone that Schlegel

states, that Russell has demonstrated that the *Aristolochia indica* is not possessed of any valuable qualities. In these experiments the snake does not appear to have shewn any decided dislike for either plants, although Orfila quoting Humboldt and Bondplandt, states, that the snake has an antipathy to the *Guaco*, and that it will not, even when excited, bite any part of the body which has been rubbed over with that plant. Lindley, in one of his most recent works, 'The Vegetable Kingdom,' states, that he believes the *Guaco* to be a species of *Aristolochia*, and adds these further notices regarding the properties of this remarkable genus—" *Aristolochia fragrantissima* is highly esteemed in Peru as a remedy against dysenteries, malignant inflammatory fevers, &c. The power of the root of *A. serpentaria* in arresting the progress of the worst forms of typhus, is highly spoken of by Barton. It acts as a stimulant, tonic, diaphoretic, and in certain cases as an antispasmodic and anodyne. It is particularly useful in supporting the strength in cases of fever. As its name implies, it is used as an antidote to serpent-bites, a quality in which several other species participate, among which may be mentioned the *A. trilobata*, a Jamaica plant, also employed as a sudden and powerful sudorific, and the Carthagena *A. anguicida*, concerning which Jacquin writes, that the root chewed and introduced into the mouth of a serpent, so stupifies it, that it may for a long time be handled with impunity; if the reptile is compelled to swallow a few drops it perishes in convulsions." Lindley then enumerates several other species of *Aristolochia*, to all of which valuable properties belong. Although I have read extensively on the subject, I am not aware of any genus that produces nearly so large a number of plants, possessed of such powerful medicinal qualities. With regard to the external application, as detailed by Mr. Lowther, Ainslie mentions, that the leaves of *Aristolochia bracteata* applied to the navel of a child, are said to have the effect of moving the bowels; and many in India can testify to

the powerful effects of another external vegetable application, in the mustard poultice.

Brande gives the following analysis from Bucholtz of the root of *Aristolochia serpentaria*: Volatile oil 0.5, yellow soft resin 2.85, extractive 1.70, saponaceous gum 18.10, lignine 62.4, water and loss 14.5: and Chevalier states, that he has found in the root malic and phosphoric acid combined with potash. It will thus be seen, that chemical analysis has proved the root to contain many valuable principles.

Although the *Aristolochias* would appear to be much more in repute as alexipharmics than any other genus, still there are several equally favourably mentioned by authors. Gesner enumerates 100 plants; but this is of course too long a list to detail. Linnæus, in his three dissertations, called *Morsura serpentum*, *Radix senega*, and *Lignum colubrinum*, has repeated the names of all plants supposed to be useful against snake-bites, with this prefatory remark:—"The Great Creator has given to the Indians, *Ichneumon cum ophiorhizä*; to the Americans, *Suem cum senekä*; and to the Europeans, *Ciconium cum oleo et alcali*." This list includes *Aristolochia indica* and *serpentaria*. The following are American, and with the exception of *Polygala*, have no near representatives in the plains, or even the low hills of India. *Veratrum luteum*, *Actæa racemosa*, Linn. (*Cimicifuga serpentaria*, Pursh.) *Osmunda Virginiana*, *Prenanthes alba*, *Aletris farinosa*, *Kunthia montana*, *Heliopsis* (*Herva des cobras*), *Polygala seneka*, *Chiococca densifolia*, *Spiræa trifoliata*. The four remaining ones of the list are all Indian, and three out of them are highly esteemed plants. 1, *Calotropis gigantea*, R. Br. (*Asclepias gigantea*, Willd.) the *Mudar* or *Akeerd*, regarding the merits of which a very valuable article was written by Dr. Wight in the 2nd volume of the Madras Journal of Literature and Science. 2, *Strychnos colubrina*, supposed to produce the *Lignum colubrinum*, and belonging to the same genus as *Nux vomica*, from which *Strychnine*, employed medicinally in paralysis, dys-

pepsia, dysentery, and affections of the nervous system, is produced. Roxburgh mentions that the wood of both plants is esteemed as a remedy against the bites of the Cobra, applied externally, and at the same time given internally. It ought, however, to be recollected, that the seeds of both are extremely poisonous. 3, *Ophioxylon serpentinum*, which Sir W. Jones describes in the 4th volume of the Asiatic Researches, under the name of *Chandra*: stating that it is called the *ichneumon* plant, and that its ordinary name is *Rasan*, which word however is used also for the rough Indian *Achyranthes* and the *Aristolochia*. Roxburgh says, it is taken inwardly against the bites of poisonous animals. Horsfield describes it as a good febrifuge, and a valuable remedy in various disorders. I do not find any particular mention of it as used in cases of snake-bites. It is very common about Calcutta, commonly growing on poor soil, in flower nine months in the year. It may be recognized as a shrub about two feet in height, having at the same time, dark purple berries about the size of a large pea, with white and pinkish flowers. It belongs to *Apocynæ*, a natural family, producing many powerful plants. 4, *Ophiorrhiza mungos*, the *Radix mungo*, called by the Malays earth-gall, in consequence of its intense bitterness, has attracted more attention in consequence of the high character given of it by Kœmpfer in his *Æmenitates Exoticæ*. He was induced principally to pay attention to the plant, in consequence of having been assured that it was the one to which the Mongoose had recourse during a conflict with a Cobra. He asserts, that he took a considerable quantity of the root with him from Java, and used it successfully in putrid fevers, and various malignant diseases, and that in several instances he had administered it efficaciously as a remedy against the bites of mad dogs, in men as well as in other animals. It belongs to *Cinchonaceæ*, a natural family noted for its febrifugal and tonic qualities, containing also one of the plants detailed above from

Linnæus' list, (*Chiococca densifolia*), which is described by Von Martius as producing the most violent emetic and drastic effects, followed by copious perspiration and succeeded by gentle sleep. Lindley adds: "the violent action of these roots, (referring to *Chiococca*) renders them dangerous to employ except in cases of poisoning, or in such maladies as require a prompt and complete evacuation of the intestines." The *Ophiorrhiza* is a native of Penang and the Deyrah Dhoon, but not of this part of the country.

It now only remains necessary to mention a few plants declared to be valuable antidotes by residents in India. In the Appendix to the 2nd volume of the Transactions of the Medical and Physical Society of Calcutta, there is a letter from Dr. Butter, from Gorruckpore, relative to a communication from Mr. Olsen, of Juanpore, strongly recommending *Phlomis esculenta*, Roxb., now *Leucas aspera*, Spr., as an invaluable specific against snake-bites. Dr. B. does not appear to entertain a very high opinion of it, nor does it appear to have been tried, in any very bad cases: moreover, it is not likely that a plant generally used as a potherb, could be very valuable where prompt and energetic remedies are required. The plant is very common in Bengal, and is known as *Chota Hulkoosa* to the natives.

Dr. Spry, in the 1st volume of Modern India, details a remarkable case as related by Dr. Maxwell, of a cure of a bite from a Cobra, effected by the use of *Trichodesma indica*, *Chotâ Kulpee* of the Bengallees, *Borago indica* of Roxb. A trooper of the 3rd cavalry was bitten by a Cobra, 3 feet long, which Dr. Maxwell himself saw. To quote Dr. Spry—"the poison immediately took effect on his system, and in a few minutes he became lethargic, foam appeared at the mouth, the animal powers grew prostrate, the lips and skin were livid; and at the time Dr. Maxwell arrived, the poor fellow appeared irrecoverable. The plant above alluded to, being in high estimation in the regiment, was procured at

the first moment of the injury, and was immediately administered. It produced no sensible effect; but to the astonishment of every one, the man rallied and eventually recovered. I can find no other mention, except, where this case is quoted, of this plant, which is common in most parts of India, and belongs to *Boraginæ*, a natural family, whose characteristics Lindley states to be soft, mucilaginous, emollient properties. We should not therefore expect to find any valuable alexipharmic in the order.

The plant forwarded by Dr. Turner, as mentioned in the first part of this paper, was *Achyranthes aspera*, *Chichiria* or *Apung* of the Bengallees, one of the plants mentioned by Sir W. Jones as being called *Rasan* along with *Aristolochia*. Two plants of the same family, (*Amaranthaceæ*,) *Gomphrena officinalis* and *macrocephala*, are reputed to be very useful, especially in cases of fever, colic, diarrhœa, and the bites of serpents.

It is to be regretted, that Russell made no experiments with vegetables as antidotes, with the exception of the slight trial of the antipathy of the snake to *garlic*, and the *Aristolochia* mentioned in a preceding page; he seems to have confined all his experiments to the use of the Tanjore pills.

With some general remarks on the poison of snakes, and the various remedies suggested, independent of the Vegetable Kingdom, I will close this article.

M. Orfila classes the poisoning by snake-bites amongst the septic or putrefying poisons, “which generally induce excessive debility, followed by syncope, and do not in many cases affect the intellectual faculties.” We must therefore be aware, that we have a very difficult class of poisons to deal with, and that when the snake is much excited, and in full vigour, it very probably will inflict in its bite an injury beyond all human remedy. However, it is certain, that numerous persons have been cured at different times, and as in

severe cases we can do no serious harm, we ought not to allow prejudice to prevent us from using every means in our reach in the hopes of being successful, even should it be in one case only, out of many trials.

In order to prescribe antidotes from theory, instead of from practice, it is necessary that we should be acquainted with the exact nature of the substance we have to contend with. Unfortunately even at this day, the exact nature of snake poison is uncertain. Not to mention the conflicting opinions of Mead, Redi and Fontana, as now comparatively of old date, before analytical chemistry was studied so carefully, as it is in present times, it is only necessary to state, that in Schlegel's work, published in 1837, it is asserted that the poison is neither acid nor alkaline, (a statement repeated by MM. Dumeril and Bibron, in 1844,) and has no peculiar smell: that according to many it may be taken inwardly with impunity (the poison of the Cobra is taken by the natives of India in cases of cholera); whilst Dr. Hering states, that in Sumatra serious consequences have occurred from taking doses of the poison of *Crotalus mutus*. Dr. Harlan, in his Medical and Physical Researches, was the first to point out that the poison of *Crotalus* contains an acid. Dr. Cantor, who, in all probability, is better acquainted with the serpents of India than any other person in the country, in 1836 writes in the Asiatic Researches, when describing the *Hamadryas*, that "the fresh poison is a pellucid tasteless fluid, in consistence like a thin solution of gum Arabic in water; it reddens slightly litmus, which also is the case with fresh poison of *Naja*: when kept for some time, it acts much stronger upon litmus, but loses considerably if not entirely its deleterious effects."

Dr. Cantor and Mr. Laidlay (Journal Asiatic Society 1847,) have found that the fluid from the venomous glands of the Cobra has in every instance readily changed the blue of litmus to red, and restored the bright yellow to turmeric

paper that had been reddened by the application of caustic alkali, an unequivocal proof of acidity, although at the same time they observe, that whereas the poisonous portion is very volatile, vanishing spontaneously in a few minutes on exposure to the air, (rendering it probable that it consists of some exceedingly unstable principle, which would be wholly disorganized under any attempts at isolation by chemical means,) still the acidity increases, and the fluid is certainly not weakened as to its effects on turmeric paper.

Experiments are still required to a great extent with the Indian venomous serpents. Indeed Orfila after giving from various authorities very full accounts of snakes from other parts of the world, says, that the whole of his article relating to Indian snakes is extracted from Russell's work, indicating that he had no other author of any consequence to refer to; and this is the case also with every author of the toxicological works I have had access to. Fontana has exhausted the subject as regards the European viper, detailing his 6000 experiments, in which 4000 animals were killed, and 3000 vipers used, in two curious volumes. All this trouble has been comparatively of little use as regards man; for Fontana declares at the end of his work, that he could never substantiate any case in which a grown person had died from the simple bite of a viper, and as he tried all the antidotes, he mentions, on the smaller animals, such as pigeons, &c. it does not, as a consequence, follow that they would have been of no use in larger animals. He made several experiments with the volatile alkali, which I have mentioned in the first portion of this paper, as having been successful in some cases under my own observation, but he despises it altogether, although he quotes some cases in which Jussieu, Sannini and de Mascena succeeded with it. Fontana's remedy is "lunar caustic dissolved in water, taken internally, and applied externally with slight scarification to the part." He adds, "I have no doubt of the efficacy of this remedy, and can affirm that the lunar

caustic is the true specific remedy against the dreadful poison." But lunar caustic is very closely allied to eau-de-luice, and caustic alkali spirit, which was used in the case I refer to personally, and which Dr. Williams in the 2nd volume of the Asiatic Researches states, he is aware to have been of use in numerous instances. He remarks also, that snake-bites are worst in hot weather.

Dr. Butter, in the 2nd volume of the Transactions of the Medical and Physical Society (1825), has given a very good account of all that had been written in India on the subject of snake poisons up to that time. The treatment recommended by him is the application of a ligature, and the administration of a dram of laudanum and an ounce of brandy, in two or three ounces of water, warm if procurable, with a little sugar and essence of peppermint. The dose to be repeated according to the urgency of the symptoms till the returning circulation and heat of the surface indicate a favorable change, which he believes to be accelerated by making the patient walk about, supported by two men. Under this treatment he states, that nine or ten cases were successfully cured in 1823, and about the same number in 1824. He prefers brandy and laudanum to ammonia. He also mentions the curious circumstance that the blood poisoned by a Cobra de capello is deprived of its power of coagulating; whereas this does not appear to have been the case in Fontana's experiment with the poison of the viper, and thus indicating, that a different treatment may be necessary in the two cases of bites from Cobras and bites from vipers. In one case detailed of a young sepoy bitten by a Cobra, and cured by the application of a ligature and giving brandy and laudanum, Dr. B. mentions the quantity taken by this lad to have been within two hours 5 oz. of brandy and 5 drachms of laudanum, equal to about 500 drops, which enormous doses, entirely swallowed, produced no soporific effects, and but a trifling degree of intoxication. He also gives it as his

opinion, that emetics would, in all probability, arrest the depressing influence of the serpent venom, but that sudorifics recommended by some writers would be most likely found to be of no more use than the viper fat of Mead.

With regard to viper's fat, and the prevalent supposition that any portion of a reptile or venomous insect was a remedy against its own poison, I would mention a curious story related in George Selwyn's correspondence with his contemporaries. In the 2nd volume there is the following letter dated Rome, June, 1768, from the Earl of Carlisle, to G. Selwyn. "I saw yesterday an experiment of an extraordinary nature. We put a mouse and a scorpion under a glass together. The mouse was immediately stung by the scorpion, and to all appearance mortally. It remained for sometime in a kind of lethargy, but on a sudden collected its strength, and in a fit of phrenzy, fell upon the scorpion, killed it, and eat its body up entirely, leaving nothing but the claws. The moment it had swallowed the scorpion the swelling disappeared, no signs of pain remained, and the poor animal was set at liberty in great health and spirits. I had refused any belief to this, a long time, against the testimony of a great many Italians. As I could believe no other eyes but my own, I shall not be offended if you do not give credit to a word of this story." The true explanation of this case would appear to be, that the bite of a scorpion is not fatal even to a mouse, although the implication is, that the scorpion's body thus devoured had remedied the wound inflicted by itself.

Olandah, in a work written in 1790, recommends a mixture of rum and Cayenne pepper as efficacious in snake-bites. There is in the 11th volume of the Asiatic Researches, a very curious account by Dr. Macrae, of a bite on his own person from a small snake, which he cured by volatile alkali. The description of his feelings is highly interesting. From experience he recommends very strong and energetic mea-

tures to be adopted in all similar cases. In the 13th volume, Dr. McKenzie mentions, that he had found volatile alkali used inwardly, and the application of carbonate of ammonia and ammonia and nitric acid to the part bitten, useful against the bites of poisonous serpents.

The 13th volume of the Philosophical Transactions, (1683) contains a paper by Dr. Tyson, giving a very full account of the rattlesnake, and merely casually mentioning the Cobra as to the fact, that its poison effervesced with the blood that a man had drawn from his leg. As regards the virulent effects of the poison of the rattlesnake, it is mentioned in the introduction to Russell's work, that whereas the bite of one killed a dog in England in two minutes, no Indian snake was observed to kill a dog in less than 27 minutes.

Boaj, in the 6th volume of the Asiatic Researches, writes a long article on the subject, which Dr. Butter in the paper before quoted disapproves of as being visionary. Boaj recommends oxides of arsenic, mercury, and lunar caustic, with ligatures and scarifications.

Dumeril in his Erpetology (1844), gives a very valuable detail of the remedies suggested ever since the days of the Psylli, as spoken of by Herodotus and Strabo, the Ophiogenes of Egypt, and the Marses of Rome, up to those esteemed in the present days. He says, "in Italy and France, after the numerous experiments of Redi and Fontana, the first thing recommended is to apply the lips to the place bitten, and endeavour to suck the poison. Also, applying a species of cupping-glass, a very thin glass bottle, with a long neck, and using hot water. Sometimes they have boasted of friction with oil, chlorine, ammonia, eau-de-luce, and these also have been taken inwardly at times with an appearance of success. Many good effects have been attributed to ligatures tied above the part bitten. As a local remedy, actual cautery by fire or otherwise, or the application of nitrate of silver, liquid nitrate of mercury, chloride of lime and antimony, caustic

Vienna paste, or a piece of pure potash, or a single drop of sulphuric and nitric acid."

Russell's remedy, called the Tanjore pills, is composed of the following ingredients in equal weights. Mercury, white arsenic, pepper, roots of *Velli-navi* and *Neri-vesham*, kernel of *Nervalam*. The mercury is to be agitated with the juice of *Calotropis* (*Asclepias gigantea*), till all the globules disappear, the other ingredients are then mixed in, and the mass formed into pills of a drachm each, and given once every hour. Unfortunately, the doubtful identity of the plants intended in the Tamul names mentioned above, renders this prescription unavailable. From enquiries made, whilst I was in the Madras Presidency, I believe *Velli-navi* to be *Cynanchum extensum*, *Neri-vesham* to be *Crinum asiaticum*, and *Nervalam* is undoubtedly *Croton Tiglium*. This remedy is however composed of so many ingredients, it is impossible to know which is the valuable one in it. Most of Russell's experiments were made on dogs, and seem principally to have had reference to ascertaining the relative power of the poison of different snakes. He however details nine cases in the human body. The three first cases were treated by himself, and cured by the Tanjore pills: the 4th and 5th, 7th and 8th cases were not treated, and all the people bitten died. In the 6th, Captain Gowdic administered eau-de-luce and madeira, and saved the life of the man bitten. The 9th case was cured by the Tanjore pills after considerable delay, the man not having been brought to Mr. Russell till many hours after he was bitten, and when he was dangerously affected.

In one case that I saw treated successfully myself at Bangalore, a syce, or *ghorrawallah*, as he is called there, had been bitten about 6 o'clock in the evening in the leg by a Cobra, which I saw and killed, he soon became very lethargic, and complained of having no power over the limb which pained him excessively. I gave him a teaspoonful of eau-de-luce in a tumbler of water to drink, and had the part

bitten also rubbed outwardly with the same alkali. I repeated the dose about an hour afterwards, and had him constantly walked up and down, supported by two men, giving him a glass of madeira every few minutes. He repeatedly entreated to be allowed to lay down and die, sooner than undergo the annoyance of being walked up and down. However, after about two hours he got gradually better, and before midnight was nearly well. His leg continued very painful for many weeks afterwards. Another case I witnessed at Bellary, was a very similar one, treated in the same way, and equally successful.

I will conclude with a few words as to the effect, that fear is supposed to have upon the action of the poison. Boaj was of opinion, that fear increased the power of the venom, but Dr. Butter in his very excellent paper states, that the symptoms have not in his experience been increased by the passion of fear; several persons having been brought to him who were bitten by snakes not venomous, none of whom shewed any symptoms of poisoning. This I have had confirmed on excellent testimony, especially in that of Dr. Cantor. I have been credibly informed, that hydrophobia has been induced solely by fear, but that there is not a single authenticated case of any effects similar to those occurring from the bites of venomous snakes having originated in fear alone.

Fort William : July 20th, 1847.

Further observations on the quality, &c. of some of the forest trees growing in the vicinity of Jeypore, Upper Assam. By Major S. F. HANNAY, (40th Regt. N. I.,) Commandant of the Assam Light Infantry Battalion.

(Communicated by Major Francis Jenkins,* Commissioner of Assam.)

I have now much pleasure in sending you a list of some others of our Upper Assam timber trees, and samples from No. 1 to 35. On a former occasion† I must have sent, with a few exceptions, the principal forest trees; amongst these now forwarded, there are, however, some I think deserving of notice, some are of course of little use, but for light work, and a few perhaps only fit for firewood, still in making a collection of woods, I think it best that all should be noticed. Besides what has been collected, I have little doubt that many valuable woods are yet in the forests unknown.

This is the Koroi of my former list; and is no doubt the same as the Bhoot Koroi, which has attracted so much attention. The Koroi and Soe mentioned below, are known in Western India as the "Serees:" both are good woods, and besides being durable, by the aid of steaming may be bent into any shape. Like the sissoo, however, it is only the heart wood that is good: the sample forwarded is a portion of a beam of a boat in water for several years. The smaller is from the root of a tree found in the river.

<p>No. 1. "Koroi." <i>Acacia odoratissima</i>, Wild., vel <i>Acacia</i> <i>marginata</i>, Hamil.</p>	<p>No. 2. "Soe." <i>Acacia stipulata</i>, Roxb.</p>	<p>The Soe is exceedingly light, but durable.</p>
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* "I have the pleasure to send you a copy of a letter from Major Hannay, of the 19th ultimo, with notes regarding 35 further samples of the timbers to be found in the forests near Jaipur.

"The samples have arrived, and I will forward them by the earliest opportunity.

"The Botanical names have been added by Mr. Simons; and having only the local names to guide him, some may be doubtful."—*Extract of a letter from Major Jenkins, dated Gowhatti, 23rd July, 1847.*

† See Journal Vol. iv. p. 117.—Ems.

This is one of the varieties of the "*Huluck*," No. 27 of my former list; but much improved by having been for many years in the Dehing river, the waters of which, as well as the Desang, possess the quality of improving the timber of all trees containing "*Tannin*."

The "*Helos*" is, I believe, known both in Sylhet and Bengal; it is very common, but does not grow larger than 12 or 14 inches in diameter, it is a pretty ornamental tree, with dark-green foliage, and produces a quantity of fruit like the barberry. This is a tree highly affected by the waters of the Dehing, pieces being found quite black, and as heavy as iron.

One of the varieties of the "*Sopa*" of my former list, also much improved by the waters of the Dehing. I bring this to notice as a valuable wood, and I should say quite equal to teak for durability in water.

A sample received from Lieut. Reynolds, and brought to notice by him as the "*Kechur*" of the Luck-impoor Hills, and said by the natives to be a most durable and valuable wood, and recommended as such by Lieut. Reynolds for railway purposes. The wood looks well, and I think with the *Kechur*, *Nahor* No. 1 and *Uriam* No. 34 of my former list, we have timber well adapted for railway or any other work, requiring great strength and durability.

A very good servicable wood, called in Assam "*Panee Moodee*," grows in low situations at the foot of the hills; stands weather and water.

This is the third variety of the "*Bola*," No. 15 of my former list. It is called *Noonee Bola*, from the leaf being similar to that of the *Mulberry*.

Called by the natives a Pomā or Tooni, but although the tree is similar in appearance, the wood is much heavier and harder; and has more the appearance of mahogany.

No. 9.
"Poma."
Cedrela.

Called by the natives "Bon Boogree," the Boogree being the Bahir of India. I have never seen it growing however, and cannot speak with certainty about the tree: the wood stands the water and weather, but is liable to split in the sun.*

No. 10.
"Bon Boogree."
Zizyphus.

Is the wood of a large creeper, very common in the jungles, the natives call it "Borokee Luta," the large thorns in it being bent at the point like a fish-hook: gives a yellow dye.

No. 11.
"Borokee Luta."

No. 12.
"Gomari."
Gmelina. Said to be a species of "Gomari," which grows in the hills.

"Kot Korah," a very common thorny tree, which produces a fruit about the size of an apple, the wood is not often discolored but white, and being close-grained, is made into *combs*, and by the turner into spinning wheels, &c.

No. 13.
"Kot Korah."

Called by the natives here "Luta Amaree," but from the appearance of the tree, I think this is the "Luta Amaree." "Kumbia" or *Careya arborea* of Mr. Masters.

This is the wood of a large timber tree called "Bailoo,"

No. 15.
"Bailoo."

it is light, and easily worked, and fit for all inside work or light boxes, &c. Boats (canoes) of a very large size are sometimes made of the tree, but they will not last beyond two years; the tree is common in the jungles of Upper and Central Assam.

This is called "Hu Khun," a very conspicuous tree in the jungles, growing sometimes very erect, with branches opposite, and hanging down with long pendant leaves (opposite), large handsome white flowers and fruit: the

No. 16.
"Hu Khun."
This I have no doubt is the long-leaved Lagerstrœmia.—F. J.

* What I think is not the case with the Bahir.—F. J.

natives call it a species of "Huluck," but the flowers and leaves are quite different. The wood of the "Hu Khun" is fit for all inside work.

No. 17.
"Phalap," *Thea viridis*. The "Phalap" or tea tree.

No. 18.
"Poreng." "Poreng," a common wood, grows large on the hills.

The "Jugroo," a very common tree growing up very quickly on ground that has been cultivated; the wood is very much prized as firewood and for charcoal: from incisions made on the stem a red gum exudes.

No. 19.
"Jugroo."
Rottlera peltata, Roxb. "Mor Moree," common in the jungles, and grows to a considerable size. The wood in large trees is red in the heart: it is close-grained, easily worked, and I am told durable.

No. 21.
"Boroon."
Cratogeomys Roxburghii, W. & A. This is a large tree found in the jungles, called "Boroon" and believed to be common in Sylhet; it is easily worked, light, and durable for boxes and all inside work.

No. 22.
"Lete Khoo."
Pterocarya sapida, R. "Lete Khoo," a tree bearing a fruit eaten by the natives, the wood of which, when well-seasoned, is close-grained and durable. It does not however attain to any considerable size.

No. 23.
"Kolee Oree." "Kolee Oree," a light close-grained wood, which would be found very useful for all light work. It is common in the hills and plains, and is a handsome flowering tree.

No. 24.
"Bor Tekra."
Garcinia pedunculata, Roxb. "Bor Tekra." One of the Tekras which has a fruit eaten by the natives in the green state, and also cut up in slices and dried, and thus sold and used in the same way as dried mangoes. The fruit also makes a very good jelly. The wood, when seasoned, is useful.

No. 25.
"Panceal."
Flacourtia 'cata-
phracta.

"*Panceal*," one of the fruit trees of Assam; the wood, when seasoned, is close-grained, hard, and durable.

"*Tekra Moe*."

No. 26.
"Tekrd Moe."
Rhizophora.

I am unable to ascertain why this tree is called a *Tekra*. The wood is hard, heavy, and durable: the tree is of a large size on the hills, and is highly ornamental, with a rich, large, oval-shaped dark-green leaf.

No. 27.
"Tokro."
Bauhinia tukra ?
Ham.

"*Tokro*," the wood of this tree is esteemed as hard and durable, and the tree grows to a large size.

"*Sotecana*."

No. 28.
"Sotecana,"
vol
"Chutyan."
Alstonia scholaris,
R. Br.

This is a wood much prized by the natives, particularly as beams or sotees; hence the name according to the Assamese; but it is a tree well known in India, and is called *Chutyan*, the bark of which, and the milky juice, is used medicinally, the wood is light, tough, and durable, and is used for tulwar scabbards and all light work (and growing in Assam to a very large size), for boxes, trunks, &c.

"*Baudoor Deema*," a very handsome tree, abundant in the jungles, bears a large fruit, the size of a ten-

No. 29.
"Baudoor Deema."
Guarea binectarifera,
Roxb.

pound ball, growing out from the stem, the kernels of which, when fresh, seem to contain oil: the wood looks close-grained, and would no doubt be useful.

"*Kudum* or *Rughoo*": this is a fine tree, very common,

No. 30.
"Rughoo."
Nauclea cadamba,
Roxb.

and grows very fast; the wood is light and soft, and might be used in light work.

This is a very good wood, being tough, light, and durable

No. 31.
"Bual."
Ehretia serrata,
Roxb.

when seasoned, and easily worked; the handles of the Singphoo heavy short-sword or *dhor* are generally made from this wood, and it is considered as good for gunstocks, which

I think is likely when from a large tree and thoroughly seasoned.

No. 32. I do not know this wood, but it looks a strong and rather close-grained wood, and is easily worked.

No. 33. The most common of the Mooga trees :
"Goss Mahoote." wood stands very well when under cover.

An ornamental tree, planted on the sides of the public

No. 34. roads ; it has the laurel leaf ; and the wood,
"Soom." when fresh, has a slight smell of camphor,
Tetranthera lanceo- and the leaf, when rubbed, has also a scent
folia, ? Roxb. of the same kind (hence the name I presume "scented leaf.")

One of the trees which supplies black varnish by incisions
No. 35. in the bark and from the fruit ; the leaves
"Amseea." and branches are similar to the *Spondias*,
Spondias ? the fruit smaller, but like the Hog-plum.

Every one in Assam knows this tree ; the fruit, though used

No. 36. by all classes of natives, is despised by
"Ou Tenga." Europeans, although, I believe, a very good
Dellenia speciosa, jelly might be made from the outer rind.
Linn.

The tree, when growing by itself, is ornamental, and the large white flowers are beautiful. The wood, though not generally known, is valuable for its durability in water, and no wood could be more usefully employed in the bottom of trading or other boats ; it grows large, and in some situations is quite a forest tree. The knotty stems of some of the large trees would, I think, make handsome wainscotting.

N.B.—In making a large collection of different woods, it is not always possible to get samples of old seasoned wood, nor portions of the largest trees of the different species ; this therefore must account for a good many of the accompanying samples being from young trees, and not seasoned.

Jeypore : 19th June, 1847.

Notes on the Kunchoora fibre of Rungpore ; by Dr. CAMPBELL, Superintendent of Darjeeling ; and T. F. HENLEY, Esq.

In the *Eastern Star* of the 26th ultimo, there is a very interesting article on the plant supposed to yield that fine fabric the China grass-cloth. The authority of Buchanan is quoted in support of the supposition that the plant is also a native of Dinagepore and Rungpore, where it is known and cultivated under the name of "*Kankhura*." As the *Star* is anxious to obtain further information on this plant, I beg leave to offer the little I know about it, and to tell you where and how you can procure additional and valuable particulars.

In the month of January last, when I was returning from the Bootan Frontier, through the district of Rungpore, my attention was attracted by small patches of a green crop, cultivated with much care, close to the villages along the banks of the Tecshta River. I had never seen the plant before, and as winter crops are rare in that part of the country, it was an object of additional interest.

It turned out to be the "*Kankhura*," and is considered by the people to be a species of hemp. It is sown at the end of the rains, and cut or pulled in February and March. It is of a dark-green color, grows to 3 or 4 feet high, and does not particularly resemble any of the nettles I am familiar with.* The leaf is not unlike that of the black currant. It is cultivated with much care, principally by fishermen or others along the river banks, and exclusively for making fishing nets, for which purpose it is considered unequalled by any other kind of hemp. The fibre is wonderfully strong, and it stands wetting for a long time without injury. It is not used, I believe, in making any description of cloth or for ropes. The preparation of the thread is similar to that of hemp.

When at the Durwany sugar-works, about the same time, I learnt that Mr. Henley of Calcutta was very anxious to

* The grass-cloth plant is supposed to be a nettle.

procure a large quantity of the "*Kankhura*" for use in the factory, and that efforts were made to purchase a supply, but without success, as the people who had grown it for their own use would not sell it; and previously there was no extraneous demand for it. The fibre of the "*Kankhura*" is extraordinarily tough, and would be highly valuable in rope works or for the purposes proposed by Mr. Horsfall of Leeds, in the manufacture of cloth. I would suggest that samples of the Rungpore *Kankhura* be procured through the manager of the Durwany sugar-works, Mr. Ahmuty, and submitted to the valuation of a competent person, and the price it is worth in Calcutta or England made known in the districts in which it is cultivated, with a view to producing a quantity of it for the English market. If the requisite information as to price can be obtained, I shall be glad to assist in communicating it to the people in the portions of Rungpore along the Bootan Frontier.

Darjeeling : July 12th, 1847.

A. CAMPBELL.

• In addition to the remarks of Doctor Campbell on the Rungpore *Kunchoora* hemp, the following memorandum contains the results of my own enquiries on the subject.

Feeling convinced of the excellence of the description of fibre in question, I endeavored when in Rungpore to collect a quantity, and succeeded in procuring a moderate-sized bale of it, which has been forwarded to a house in London, requesting a report of some of the large hemp and flax spinners of Lancashire. This information may shortly be expected. It is difficult in the present state of the enquiry to ascertain the price at which it might be procured eventually, if the stimulus of advances of funds for its cultivation were made. It is now only procurable at very high and variable rates in small parcels from the fishermen. Under any circumstances, it appears to me that it must necessarily be a much more expensive article than either *sun*n or *jute*, inasmuch as a laborer

can prepare one and a half to two maunds of *jute* per day's work, whilst of the *Kunchoora*, he cannot manufacture more than as many seers. The *jute* and *sun* fibres are separated from the woody stems by the process called water-retting, in a similar manner to that employed in the preparation of the true hemp and flax; a process by which the removal of the fibre from the stems is rendered of easy accomplishment. The above nettle on the contrary requires a tedious manipulation. The bark or epidermis of each individual stem must be carefully scraped off the fresh cut plant, a most tedious and delicate operation. The natives declare that the fibre cannot be separated by the water-steeping process, and they are doubtless correct on that point. The scraped stems are then spread out in the sun and dried to a certain point, after which they are beaten carefully one by one, in order to facilitate the separation of the fibrous coat which is now removed by being pulled off each plant, still operating one by one on the plants, and not in bundles as is the case when operating on other fibres. The fibres now require to be carefully washed, in order to separate the remaining impurities. This sketch will serve to show whence it arises that a laborer employed in the manufacture of the nettle hemp can only prepare about one-fortieth part of what he could have accomplished with the *jute* fibre. The plant itself is perhaps of easier cultivation, and more productive from a given surface than *sun*, as it will yield several cuttings from one planting. It requires however a rich free soil, and plenty of manure. The second and third cuttings produce a much weaker but a finer fibre, and it is not improbable but that the Chinese in their grass cloth manufacture select the after crops for their purpose. Some experiments made by bleaching and heckling a portion of first crop *Kunchoora*, did not produce so fine and silky a material as that of the China grass-cloth, but as my experiment was hastily and imperfectly made, it is by no means conclusive. As I have noticed above also, it is probable that

a very different result would arise from the employment of the after-crop fibres, or by the selection of the young and delicate shoots, which actually do produce a much more flax-like material. It is possible the Chinese by adopting these means may produce textile materials of very different qualities. The large stems, near the lower part of the plant, yield a very tough but coarse product, admirably adapted, however, from their immense strength for many purposes.

Some comparative experiments were made with European hemp compared with the Rungpore *Kunchoora*, by loading small bundles (four picked fibres loosely twisted) of each kind to the breaking point, and taking the average of several trials. These experiments showed that the nettle fibre possesses about three times the strength of Russia hemp. The latter being of an excellent quality, imported into Calcutta for special purposes.

I had the *Kunchoora* also employed for packings of steam engines, in which it proved quite efficient; the ordinary country fibres, such as *sun*n and *jute*, being totally useless for that purpose.

The question of the identity of the China grass and nettle fibre seems yet quite unsettled, and it is extraordinary that Mr. Fortune, during his botanical sojourn in China, should not have cleared up so interesting a point. I have now in my possession a couple of plants of the Rungpore nettle or *Urtica tenacissima*, which might serve for reference in any further enquiries on the subject.

It is hopeless to expect that the nettle fibre can be produced at so low a price as the other descriptions of textile materials of the country, so long as the present laborious method of separating the bark and fibre is employed. I am however, of opinion, that mechanical arrangements could be made, by which the separation and thorough cleansing of the fibre could be accomplished on large quantities with great facility and economy.

T. F. HENLEY.

A Memoir of some of the natural productions of the Angami Naga Hills, and other parts of Upper Assam. By J. W. MASTERS, Esq., Sub-Assistant to the Commissioner of Assam.

(Communicated by the Government of Bengal.)

PLANTS.

The Flora of that portion of the Angami hills which I have hitherto had an opportunity of visiting, does not present so great a variety of species as that of the hills more to the eastward, but the flora of the whole valley of Assam, including the surrounding hills, presents an immense variety of curious, useful, and interesting plants, growing in the greatest luxuriance. Dried specimens of about 2,000 species, belonging to upwards of 130 families, accompany this memoir.

RANUNCULACEÆ.—Of this family I observed only 2 plants on the Angami hills, *Naravelia Zeylanica*, which is common everywhere in the plains, and one species of *Ranunculus*. This tribe is not very abundant in the plains, 2 or 3 species may be met with in the rains, but the most interesting plant of the family that I have seen is that very pretty, showy, freely flowering creeper which Dr. Roxburgh calls *Thalictrum bracteatum*. At Bhagdwar and at Luckimpoor, it trails on the ground among reeds and grass; on the banks of the Sasa in Muttock, it twines its branches round, and spreads over the low bushes; but on the banks of the Kadadanga, in the Seëbsagur district, it assumes a more gigantic habit, spreading and running to a great extent, covering the low trees with its beautiful flowers.

PAPAVERACEÆ.—I saw no poppy cultivation on the Angami hills, though the plant is cultivated to a small extent by the Lota Nagas, and at Kaboong. Throughout the plains it is plentiful; the Assamese even cultivate for the Nagas at the foot of their hills.

NYMPHÆACEÆ.—This water lily tribe, though scarce on the hills, is abundantly distributed all over the plains. The beautiful, large, white *Nelumbium*, so common in the Seëbsagur district, is exquisitely fragrant.

MYRISTICÆÆ.—Although no real nutmeg has hitherto been found in Assam, yet one species of *Myristica* is indigenous to the Naga hills, another common in Muttock, in the Satsoeah forest, and at the foot of the hills at Dibrooghur. A specimen of *M. macrophylla*,

Roxb. was sent to me from Major Jenkins, found near Gowhatty; it is therefore probable that the true nutmeg would thrive in some parts of Assam.

MAGNOLIACEÆ.—Plants of this family are distributed all over the hills and plains. One species, *Magnolia sphænocarpa*? is common in the low hills, and also in the plains immediately at the base of the hills on both sides of the valley. Of the genus *Michelia*, 3 or 4 species are indigenous to the Naga hills. What I suppose to be *M. obovata*, Wall., I found growing at Dibboo Mookh, a little below Dheemapoor. *M. oblongifolia* at Dibrapoor, and another species of the same genus on the banks of the Dikho, far in among the hills.

ANONACEÆ.—The most common plant of this family which is to be met with on the Naga hills, is *Uvaria macrophylla*, it is also plentiful about Saikwah and Sudiya, and along the banks of the great river all the way up to the Koond; one species of *Anona*? I found at Mickeloi, at an elevation of about 3,000 feet. *Guatteria Badajamba* is also common on the hills. *Uvaria bicolor* and several other species of that genus are scattered over the plains, while *Anona squamosa*, *A. muricata*, and *A. reticulata* are found growing in gardens and villages, and thrive luxuriantly. *A. muricata* has been but lately introduced.

DILLENIACEÆ.—Whole forests of *D. speciosa* are to be found at the foot of the hills, along the banks of the Dhunsiri, the Dyung, and the Jumoua. *D. angusta* and *D. pilosa*, together with *Dillenia sarmentosa* are common on the hills, the latter plentiful in all forests in the plains. I observed another species of *Dillenia* on the Mikir hills, which was probably *D. scabrella*?

UMBELLIFERÆ.—The plants of this family are not very abundant either on the hills or in the plains. *Hydrocotyle Asiatica*, *H. polycephala*, and *H. tenella* are found at Luckimpoor and Rungpoor, and I have three or four other species of this family in my herbarium but they are not of much importance.

ARALIACEÆ.—*Aralia digitata* of Roxburgh, which is common all over Assam, is also plentiful on the banks of the Dibboo Panee; on higher ground two or three other species were observed, but not in blossom; they appeared to be identical with those which I gathered about Namsang, Kangsang, and Lakhootee, and also between Run-

gagora and Saikwah. Specimens of which are to be found in my herbarium now in the possession of Government. *Aralia lucida*, Wall., is indigenous to the Naga hills. At Cheerideo Purbut is found *Panax fragrans*, and at Dibboo Mookh *P. aculeata*.

BERBERIDEÆ.—The only plant of this family which I have observed is *Nandina domestica*, found growing at Rungagora, in Muttock.

VITACEÆ.—Along the banks of the Dibboo and Jhumka rivers, vine-like plants are plentiful, some of which rise to higher elevations, where two or three species of *Leea* are common, but I did not observe any on the Angami hills, which appeared to me to be of any particular interest or different from what I had before gathered: among those common in the plains are *Vitis lanata*, *V. carnos*a and *adnata*, *Leea sambucina*, *hirta* and *crispa*, with several other species.

OLACINÆÆ.—Of this family *Ola*x *scandens* is common on the Naga hills, and *O. Zeylanica* is plentiful on the banks of the Dhunsiri.

ONAGRACEÆ.—Of this order *Jussieua repens* is the only plant which I have observed near the hills. In the plains we have *Trapa bispinosa*, *Ludwigia prostrata* and *parviflora*, two or three species of *Ænothera* and one species of *Isnardia*. All these are to be found about Seobsagur, Rungpoor, Jorehat, and Luckimpoor.

COMBRETACEÆ.—I observed several interesting plants belonging to this family on the Angami hills, but the most conspicuous was that powerful climber *Poirrea Roxburghii*, which I found at Mezapamot, Razepamot, along the banks of the Dibboo, under Sumooguding, and all along the banks of the Jumoona. I have gathered it also on the banks of the Dyang, near Souoree Gaon, in the Lota Naga hills. (*Uncaria sessilifructus* is not less common.) The above two, though curious and ornamental, are of less value than the timber trees which this family affords. The fruit of *Terminalia Chebula* was picked up on the high range, but I did not observe any remarkably large trees of any kind on the Angami hills. The timber trees which I saw were diminutive in bulk compared to the same species found in the plains, except a species of *Gordonia*, which arrives at its maximum size on the hills, and becomes a very useful timber tree. The most valuable timber tree belonging to this family

with which I am acquainted, is *Terminalia paniculata*, the *Hullock* of the Assamese. This grows in great perfection along the banks of the Dhunsiri, towards Dheemapoor. I have also seen beautiful specimens of this fine tree on the banks of the Soondree, in among the Duphla hills, in Satsoeah, in Muttock, at Jeypoor, at Saikwah, and all along the banks of the Brahmapootra clear up to the Koqud.

ALANGIACEÆ.—*Marlea begoniaefolia* belonging to this tribe, is common about Gungaon, Deorgaon and Luckimpoor.

RHIZOPHOREÆ.—*Carallia lucida* and two or three others are indigenous to the Naga hills.

MELASTOMACEÆ.—Of this family, so abundant in the plains and immediately under the hills, I gathered four species on the Angami hills, though unfortunately not in blossom. Specimens of two of them were found at Sumooguding, and of another, a most elegant and gigantic species in fruit, I gathered above the terraces at Mazamah. Seeds of this species were sent to Major Jenkins. Of *Melastomeæ* and *Osbeckia*, the dwarf and shrubby kinds are found in abundance all over Upper Assam, on the red, ferruginous, sandy soils, in localities that are elevated just above the annual floods, where four or five species may not unfrequently be seen growing all together.

They are most plentiful at Luckimpoor, Dibrooghur, Jeypoor, Dibrapoor, and between Deorgaon and Nazin, also immediately under the Mikir hills. The more gigantic kinds are found in all the ravines in the Naga hills, where their highly colored abundant panicles may often be met with 15 or 20 inches in length.

MYRTACEÆ.—Of this family *Careya arborea*, *Barringtonia acutangula*, and *Syzygium jambolanum* are indigenous to the Naga hills. *Jambosa Malaccensis* is found growing wild on the banks of the Jhangy and in the Satsoeah forest, *Jambosa aquea* and *scorimbosum* at Golaghat; while *Psidium pomiferum*, *Syzygium densiflorum*, *fruticosum*, and *nenosum* are common all over the plains. *J. vulgaris*, the rose apple, is found in nearly all villages, as is *Punica granatum*, and *alba* is also found growing wild at Dapabin, near to the Chœerideo Purbut. It is somewhat remarkable that the last mentioned plant, together with *J. Malaccensis*, and so many *Melastomeæ*, natives of the Malay Islands, should be so common in Assam.

LORANTHACEÆ.—Several species of the genus *Loranthus* are indigenous to the Naga hills, and are common all over the plains. *L. Hookerianus* is plentiful about Seeksagur, *L. coccineus* at Luckimpoor, and *Viscum confertum* at Seeksagur.

CUCURBITACEÆ.—The common pumpkin and bottle-gourd are found plentiful in all Naga villages, although I have never seen the living plants, as the hills are not accessible at the season of their growth. Two or three species of *Bryonia* are common on the banks of the Dibboo and in the ravines, as also *Trichosanthes species*. This family is most abundant throughout the plains of Assam. *Lagenaria*, *Cucurbita*, *Cucumis*, *Bryonia coccinea*, *Luffa*, *Momordica* and *Trichosanthes* are found almost everywhere.

CACTACEÆ.—*Opuntia Dillenii* is the only plant that I have observed belonging to this family, it is frequently met with about deserted villages.

BEGONIEÆ.—Of this family 4 or 5 species are indigenous to the Naga hills, and two species are common in the plains, and may be met with in Satsoeah and Rakan Habbee.

CRUCIFERÆ.—Of these we find little that is of importance except the mustard, which is cultivated sparingly by the Nagas, but largely by the Assamese.

CAPPARIDÆÆ.—*Gynandropsis pentaphylla* and *Roydsia suaveolens* are found on the Naga hills, and *Cratæva Roxburghii* on the banks of rivers in the plains, *Polanisia icosandria* about villages.

VIOLACEÆ.—Violets are plentiful on the hills in the cold season, and also in the plains, but they have but little scent.

SAMYDEÆ.—The genus *Casearia* is indigenous to the Naga hills, and 3 or 4 species are to be found in all the forests in Upper Assam.

PASSIFLOREÆ.—*Modecca palmata* and 2 or 3 other species of the same genus are to be found about Deogaon.

PAPAYACEÆ.—*Carica papaya* is common about villages, and grows to an immense size at Luckimpoor.

FLACOURTIANEÆ.—The *Pania*, *Flacourtia cataphracta*, is indigenous to the Angami hills, trees of immense size are to be found at Sumooguding, compared to which those found about villages in the plains are diminutive. The *Lemtem*, also *Chaulmoogra odorata* is a native of the Naga hills.

BIXINEÆ.—The *Arnotto* plant, *Bixa Orellana*, is found in the gardens of the Brahmans about Deorgaon and Jorehat.

GUTTIFERÆ.—The 3 genera *Garcinia*, *Xanthochymus* and *Mesua* are abundant at the foot of the Naga hills. *G. cambogia*, *G. pedunculata*, *X. pictorius* and *X. dulcis* are plentiful on the first Naga range, as well as in the plains, but I did not observe *M. ferrea* on the Angami hills, although it is common on the hills between the Boora Dihing and the Desing, where it appears to attain its maximum growth. It is also found in great abundance in the Dheemapoor forest, along the banks of the Dhunsiri, the banks of the Jumoonā, and along the base of the Mikir hills.

HYPERICINEÆ.—Two or three species of the genus *Hypericum* resembling *H. japonicum*, are common on the hills, and on elevated localities in the plains. Those which I have observed are all minute plants, with bright yellow flowers, found at Mohung Digna, Luckim-poor, and Dibrapoor.

TERNSTROMIACEÆ.—One of the most common trees, as well as one of the largest that I met with on the Angami hills, is a species of *Gordonia*, it is also abundant in the plains, and called *Naga Bhik* by the Assamese, who use it for their sugar mills. As a timber tree, it is but of moderate growth in the plains, with comparatively soft wood, but on the hills it grows to a large size, producing wood of a much firmer texture. To this family belongs the Assam tea plant, which is also indigenous to the Angami hills, as reported by Licutenant Bigge in January 1841: it grows along the banks of the Dibboo Pance, between Razepamah and Mezapamah, but the *Barree* appears to be of small extent, as I did not see a single plant in the line of route when going from Sumooguding to Mazamah, or when returning from thence to Razepamah. I could not learn that the tea plant is known to exist in any other part of the Angami hills. Specimens procured from the right bank of the Dibboo Pance, below the village of Razepamah, together with a large quantity of specimens collected from several different localities, both from cultivated and uncultivated plants, accompany this memoir.

SAPINDACEÆ.—Of this tribe the genera *Sapindus*, *Sehmedelia*, *Cardiospermum*, *Millingtonia*, and *Pierardia* are plentiful on the Naga hills, and also along the banks of the Dhunsiri and Jumoonā rivers,

in the Satsoeah, in Muttock, and at Luckimpoor. *P. sapida* is a great favorite with the Assamese.

HIPPOCASTANÆ.—A species of *Æsculus* is found growing in abundance on the banks of the Dhunsiri, Jumoona, Soondree, Soobansiri, Dihing, Brahmapootra, Suffoy, Dikho, and Dyang rivers.

LINEÆ.—The pretty little shrub *Linum tryginum* is indigenous to the Angami hills, and in the month of January covers a large portion of the hill on which the village of Prephima is built, with its bright yellow flowers.

STERCULEACEÆ.—Of this family several species are common on the Angami hills, of which *Kleinhovia Hospita* is most frequently met with. The genera *Sterculia*, *Bombax*, *Kydia*, *Pterospermum*, *Abroma*, *Kleinhovia*, *Byttneria*, *Melochia*, *Waltheria*, are plentifully distributed all over the hills and plains. *Pentapetes phanicea* is found in gardens only.

MALVACEÆ.—*Hibiscus macrophyllus* and *H. Griffithianus* are the most common plants belonging to this family that I observed on the Angami hills. *H. furcatus* is plentiful at the foot of the hills. Several other species of *Hibiscus*, together with the genera *Urena*, *Sida*, *Abutilon*, *Abelmoschus*, and *Paritium* are common all over the plains. The cotton plant, which is cultivated in many parts of the plains, and, largely by the Mikirs and Lota Nagas, is not cultivated by the Angamis on their hills. The Nagas of the Sumooguding village grow a small quantity at the foot of their hills.

ELÆOCARPEÆ.—The genus *Elæocarpus*, which produces the famous *Roodrakh*, is abundant on the Naga hills, often spreading out into the plains; 5 or 6 species may be met with at the base of the low hills between Borhot and Dheemapoor, also in Tooleram Burra Sonaputti's country, and at Luckimpoor.

DIPTEROCARPEÆ.—Although I did not observe any plant belonging to this family in the Angami hills, yet the genus *Dipterocarpus* grows to great perfection on the hills more to the eastward, and it is probable that the genera *Dipterocarpus*, *Hopea*, *Shorea*, and *Vatteria* are all indigenous to these hills, although *Shorea robusta*, *Sal*, is the only plant that I have been able to determine, never having been able to procure any good specimens of the other species. The *Sal* is found in the Sungmay Habbi, and is abundant in the Nowgong district.

TILIACEÆ.—Of these *Triumfetta ovalifolia* and *trilocularis*, with a species of *Grewia*, are common on the Angami hills; but the tribe does not appear to be so abundant as in the plains, where we have *Triumfetta pilosa*, *bilocularis*, *oblongata*, *trilocularis*. *G. orientalis*, *sepiaria*, and *columnaris*. *Cocchorus olitorius*, *capsularis* and *trilocularis*, with one or two other species.

LYTHRACEÆ.—*Lagerstræmia grandiflora* of Roxburgh is found at Dheemapoore, growing to an immense size. *L. Regina* and a species of *Ammannia* I observed farther among the hills. *L. elegans* is common in the plains, and *Lawsonia alba* in gardens at Jorehat.

MELIACEÆ.—Of this tribe *Amoora Rohituka* is indigenous to the Naga hills, *Melia composita* I found at Dibboo Mookh and along the banks of the Dhunsiri, *Walsura robusta* at Dibrooghur, *Quivisia heterophylla* at Rungagora, and *Aglaiia undulata* at the Bramakoond.

CEDRELACEÆ.—To this tribe belongs the famous Toon timber tree, the *Poma* of the Assamese, which is common in the Dheemapoore forest and on the hills to the eastward, it is found all over Upper Assam. In the Seesagur district the Assamese have another *Poma*, *Chickrassia tabularis*.

AURANTIACEÆ.—This family, containing the orange and lemon, is plentiful in the Naga hills as well as in the plains of Assam. *Citrus medica* is an undoubted native of the Angami hills. I found it plentiful along the banks of the Dibboo Pance, between Takajana-mah and Razepamah, and along the banks of the Dhunsiri it is also common, most abundant about Dheemapoore. Fruit of a superior variety was brought to us at Mezepamah, a lemon. The orange and shaddock, though common, are found about villages only. *Triphasia trifoliata* is also a native of the Naga hills, with two or three species of *Limonia*. In the plains we have besides the above, *Bergera Koenigii*, *B. (or Micromelum) integerrima*, *Ægle marmelos*, and *Glycosmis species* at Seesagur, *G. pentaphylla* at Luckimpoore, *Murraya exotica* in Tooleram Burra-Sonaputti's country: this last is also found at the Bramakoond, in company with *M. paniculata*.

SPONDIACEÆ.—*Spondias mangifera*, *Amra*, is common on the hills and plains, at Kangsing, Jorehat, Nazera, Jypoor, Dibrooghur, Saikwah, and Luckimpoore.

RHAMNACEÆ.—The genera *Zizyphus*, *Rhamnus* and *Ceanothus* are indigenous to the Angami hills. *Z. jujuba*, *C. nepalensis*, *Vitmannia Africana*, *Gonania leptostachya* and two species of *Rhamnus* are common all over Upper Assam.

EUPHORBIACEÆ.—Several plants belonging to this very large family were observed in the Angami hills, the most conspicuous was *Euphorbia pentangularis*, which is to be seen at Mezapamah, growing in the stockade which surrounds the village. *Cluytia ovalifolia* is common at Sumooguding and elsewhere, together with *Croton drupaceum*, *Excæcaria Agallocha*. *Embllica officinalis* assumes a stunted appearance on these hills, but at the foot of them, and on elevated sites throughout the plains, it grows to a moderate-sized tree. The shrubby, straggling *Philantheæ* are common on the banks of the Dibboo and Dhunsiri rivers. Scattered all over the plains we find the genera *Andrachne*, *Cluytia*, *Briedelia*, *Croton*, *Rottlera*, *Ricinus*, *Janipha*, *Jatropha*, *Sapium*, *Bradleia*, *Batis*, and *Euphorbia*.

CELASTRINEÆ.—Several of the climbing plants belonging to this family are common near the base of the hills and in the Dheemapoor forest. I have gathered specimens of *Celastrus* at Dibrooghur, Run-gagora, Deorgaon, Cheerideo, and on the Naga hills. Of *Salacia* in Satsorah, Seesagur, and in the Sohonoï, and of *Euonymus* at the Jumoonā falls, the Tokpheng Purbut, and at Saikwah.

MALPHIGIACEÆ.—Two species of *Hiræa* are found in the vicinity of Seesagur.

TAMARISCINEÆ.—A species of *Tamarix* is common on the sands of the Brahmapootra and of other rivers near to the hills.

XANTHOXYLEÆ.—Two or three species of *Xanthoxylum*, with one species of *Ailanthus*, are indigenous to the Naga hills and plains of Assam.

BALSAMINEÆ.—Of this family *Impatiens natans*, *ilatifolia*, and two or three other species are peculiar to the Naga hills, while three or four other species of the same genus are scattered all over the plain.

OXALIDEÆ.—The plants belonging to this small family are highly prized by the Assamese and Nagas. *Oxalis sensitiva* I observed in abundance at Sumooguding, and *Averrhoa Carambola* grows to be a large tree on the hills more to the eastward.

ROSACEÆ.—Of Roses I have observed none indigenous to the Naga hills, but the genus *Rubus* is plentiful, *R. rugosus* and *Wallichianus* at Sumooguding and Mazamah; the latter plant I have gathered on the hills to the eastward, Akook, Kangsing, and Lakhooti, where *R. rosæfolius*, *racemosus*, and *hexagonus* are common. A species of crab apple is common about Mezapamah and Mazamah, and peach trees are found in villages. *Fragaria indica*, Roxb. is common; this last is indigenous to the plains; as is *Cerasus Jenkinsii*, an edible fruit tree.

LEGUMINOSÆ.—The plants belonging to several genera of this very large family are abundant on the Angami hills. A species of *Phaseolus* is cultivated. *Acacia stipularia* and *speciosa* are common everywhere, as are *Erythrina stricta* and *Desmodium polycarpum*, *Crotalaria alata*, *Inga species*, and *Bauhinia purpurea*. That beautiful creeper *Butea superba* is found growing on the Sumooguding hill, and is very common along the base of the Mikir hills. *Acacia pinnata* is exceedingly common in the Dheemapoor forest, and together with a species of *Casalpinia* is found growing about villages on the hills, apparently planted round the stockade as a defence. *Mucuna prurita* is found on the banks of the Dibboo Panee. Plants of the following genera are indigenous to the plains of Upper Assam. *Entada*, *Abrus*, *Adenanthera*, *Tamarindus*, *Alysicarpus*, *Mimosa*, *Hedysarium*, *Dunbaria*, *Ervum*, *Robinia*, *Sesbania*, *Æschynomene*, *Uraria*, *Jonesia*, *Desmodium*, *Flemingia*, *Erythrina*, *Butea*, *Cassia*, *Dalbergia*, *Dolichos*, *Canavalia*, *Pongamia*, *Milletia*, *Crotalaria*, *Bauhinia*, *Acacia*, *Guilandina*, *Agati*, *Phaseolus*, *Connarus* and *Cnestis*; *Dunbaria species* and *Robinia macrophylla* are natives of the Naga hills; *Vachelia Farnesiana* is found about villages; *Jonesia asoca* is found in Muttock; *Cassia glauca* and *fistula* on the hills; *Dalbergia robusta* plentiful on the banks of the Jumoon, at Saikwah, and at Noa Dihing Mookh; *Dalbergia Sissoo* at the Bramakoond; *Milletia splendens*, an elegant creeper, at Seesagur; *Cantharosperrum pauciflorum* at Seesagur; *Phaseolus trinervum* and *calcaratus* at Seesagur and Luckimpoor. That curious plant, *Desmodium gyrans*, is found plentiful about Gurgaon in the rainy season, together with *Uraria picta* and *hamosa*; *Clitoria ternatea* is found about villages; a species of *Connarus* in the Satsoeah forest, and *Cnestis monudelpha* at Saikwah.

ANACARDIACÆ.—Of these, *Semecarpus anacardium*, *Mangifera sylvaticum*, with two species of *Rhus*, are indigenous to the Angami hills. *M. indica* appears less common than in the villages more to the eastward, where very large mangoe trees are to be seen in almost every Naga village. The above-mentioned, with *Phlebochiton extensum*, are common in all forests near the base of the hills, but *Holigarna racemosa* and *Buchanania angustifolia* I have met with on the Naga hills only.

CUPULIFERÆ.—Of oaks I observed but few on the Angami hills, although I have no doubt but that I passed under hundreds: the site in which I supposed them to be growing was so precipitous, that I durst not look up to see what trees were growing over my head, all I could do was to collect a very few acorns, and these were exceedingly scarce, as the path which ran along the side of an almost perpendicular clift, was seldom more than two feet wide, and often much less. I observed an oak at Prephimah, but it was without fruit. On the hills beyond the Dyung river oaks are abundant. In the plains we have several species of chesnuts; these are common in the Dheemapoor forest, along the banks of the Jumoona, in Muttock, and at Saikwah.

URTICÆÆ.—Nettles and fig trees are plentiful on the Angami hills, as is *Artocarpus Lakoocha*. Of two or three species of nettle the Nagas of Mazamah make a strong and durable cloth, for which purpose the fibres of the *Phapat*, *Urtica heterophylla*, are in most repute among them, the plant grows in abundance about Mazamah, and is common also in Upper Assam. Dr. Roxburgh correctly describes this species in a few words: "This is the most ferocious looking plant I have seen, and it acts up to its appearance; the least touch of any part produces acute pain, but fortunately of short duration. The bark abounds in fine, white, glossy, silk-like strong fibres." As the plant stings exceedingly, it is very unpleasant to handle, and is consequently not so valuable a plant as the common *Rheea* of Assam, *Urtica nivea*, which is cultivated by the Dooms for net twine, it does not sting, and yields a more abundant crop. Of stinging nettles none are more common in the plains than the Surat, *U. crenulata*, it is to be met with in all forests, and generally about all villages in Central and Upper Assam, and is most abundant about Dheemapoor. On the

11th December last, when clearing away the jungle about the stockade, and straightening the road towards Sumooguding, a large quantity of this gigantic nettle required to be cut down; the plants, male and female, were in blossom, some of the latter had fruit nearly ripe. The male plants were still scattering their pollen, and some had discharged so much, that the air was charged, and the leaves of other plants completely covered with it. Cutting down the jungle set this all in motion, and although I had not touched the plant, yet the effluvia had such an effect upon me as to bring on a violent sneezing and incessant running at the nose. Captain Butler, and several of the natives were affected in a similar manner, though not to the same degree. The cause I well knew, having experienced the same effects in November 1842, when I was slightly stung on the back of the hand. In that instance the sneezing continued for about an hour, the pain was excruciating when the hand was placed in cold water, and did not finally leave me for fifteen days. On my recent return to Dheemapoor I was stung by the leaf of the plant, and experienced similar effects, but less violent. The pain left me in seven days.* Notwithstanding this property of the Surat, elephants eat it freely. In Assam I have gathered about thirty species of nettles, and as many species of figs.

ULMACEÆ.—One species of elm is indigenous to the Naga hills, and is found at the falls of the Jumoona. * *Celtis orientalis* is common to the hills and plains.

STILAGINÆ.—Of this tribe three species of *Stilago* and two species of *Antidesma* are to be found in the Seebisagur district and at Luckimpoor.

* In his *Hortus Suburbanus Calcuttensis*, Voigt alludes to the powerful stinging property of this nettle in the following words :

"This plant stings dreadfully. Leschenault de la Tour (*Mem. Mus.* 6 p. 362,) happened slightly to touch with his fingers one of its leaves in H. C. G. The consequence was intolerable pain, without any swelling, extending to the armpit, and subsequently producing frequent sneezing, copious running from the nose, and a contraction of the jaws. The pain abated somewhat after the lapse of two days, but returned in full force when the hand was put into water, and at last disappeared on the ninth day. A similar circumstance occurred, with precisely the same symptoms, to a workman in the Calcutta Garden. This man described the sensation, when water was applied to the stung part, as if boiling oil was poured over him."—EDS.

MYRICACEÆ.—The only plant of this family which I have observed is *Putranjiva Roxburghii*, this is common to the hills and plains, and found at Kangsing, Rungagora and Luckimpoor.

JUGLANDACEÆ.—The only species of *Juglans* of, which I have been able to procure good specimens, is *pteraococca*, Roxb. ; this is common to hills and plains.

PIPERACEÆ.—*Piper sylvaticum*, *longum* and *rostratum* are common on the Naga hills. *Peepuloides* is found at Deorgaon, and *P. Bette* is cultivated by some of the Nagas at the foot of their hills, and brought down into the plains for sale, it is also cultivated by the Assamese.

SALICACEÆ.—One species of willow, *Panee Behi* of the Assamese, is found plentiful about Gurgaon and Dibrooghur.

BALSAMACEÆ.—Liquid amber species, *Joolooti* of the Assamese, is found growing at Langta, on the Naga hills, at Rungagora, and other parts of Muttock.

ELÆAGNEÆ.—Of the genus *Elæagnus* I observed one species at Mazamah, two others are to be found in the plains at Deorgaon and the Jumoona falls.

AQUILARINEÆ.—*Aquilaria Agallocha*, the *Sanchi* of the Assamese, is indigenous to the Naga hills and the plains of Assam.

THYMELACEÆ.—A curious plant, called by the late Dr. Griffith *Jenkinsia Assamica*, and placed by him in this order, is to be found at Luckimpoor.

LAURINEÆ.—The genera *Laurus*, *Cinnamomum*, and *Tetranthera* are plentifully distributed all over the hills and plains. *C. dulce* at Cheerideo.

AMARANTHACEÆ.—*Deeringia celosioides*, *Amaranthus spinosus*, and *Celosia cristata* are to be found on the Angami hills, and together with 2 or 3 species of *Achyranthes* common in the plains.

CHENOPODEÆ.—A species of *Basella*, *Horoopoorooihak*, is indigenous to the base of the Naga hills. *Brubia* is occasionally cultivated, and *Chenopodium viride* is a common weed at Seeksagur and Luckimpoor.

POLYGONEÆ.—Of this family *P. chinensis* ? is plentiful on the sides of the Angami hills and in the ravines, where it grows most luxuriantly, but I saw no other species more equally common. In

the plains the plants belonging to this family are abundant. *P. Fagopyrum* is cultivated by some of the hill tribes also in the vicinity of Saikwah and Sudiya. *P. fragrans*, a little sweet-scented annual, is common in rice fields in the Seeksagur and Luckimpoor districts. Of the genus *Rumex*, two species are found on the banks of rivers.

NYCTAGINEÆ.—The marvel of Peru, *Mirabilis Jalapa*, I found growing at Sumooguding; it is also common in Assamese villages.

EBENACEÆ.—The genus *Diospyros* is abundantly distributed over the Naga hills, and two or three species are found common in the plains. *Styrax serrulata* is found plentiful at Dibrooghur.

CONVOLVULACEÆ.—Of this tribe *Argyrea splendens*, *Astrigosa*, and *Argentia*, with *Porana racemosa*, *Convolvulus vitifolius* and *pentogonius* are indigenous to the Naga hills. *Ipomœa grandiflora* is abundant at Dheemapoor, while several other species are common to the plains.

LOBELIACEÆ.—An elegant plant belonging to this family, *Lobelia robusta*, Wall., is indigenous to the Angami hills. I saw fine specimens of it at Prephima in blossom in January.

CAMPANULACEÆ.—Of this family a minute species of *Wahlenbergia* is found growing on the terraces at Mazamah. I have also gathered a species of the same genus on the sand banks of the Dyung river, near the Lota Naga hills, and also at the mouth of the Dhunsiri.

CINCHONACEÆ.—Several plants belonging to this interesting family are indigenous to the Angami hills, but I did not observe any that are not common in the plains, such as the *Randia*, *Gardenæa*, *Nauclea*, and *Morindea*. With a root of the species of the latter genus, which is common at Sumooguding, the Nagas prepare a red dye. One of the most common plants of this family is *Coffea Bengalensis*, this is plentiful above Dheemapoor, and indeed all over the Province of Assam, from Goalparah to the Koond. I saw but one species of *Mussaenda* on the Angami hills, but as these blossom in the rains, I may have passed others without observing them. In the plains this genus appears quite at home. A species being common in the Seeksagur district, beside two very interesting species from the hills, one near the banks of the Dikho, and one from the banks of the Soondree near the Duphla hills. *Hedyotis scandens*, *Uncaria*

sessilifructus, *Nauclea parviflora*, *Rondeletia paniculata*, *Pæderia fæteda*, are common to the hills and plains. *Pavetta indica* is found at Luckimpoor, a species of *Ixora* at Rungagora, *Stylocoryna Webera*, and *Uncaria pilosa* at Nazera.

CAPRIFOLIACEÆ.—Of this tribe a species of Elder, *Sambucus Ebulus*, Roxb., or *Chinensis*, Lindl., is common to the Naga hills and plains, and a species of honeysuckle, *Lonicera Leschenaultii*, is found about Sebsagur.

COMPOSITÆ.—The plants belonging to *Compositæ* are more abundant on the Naga hills than in the plains, though none of them are of much importance further than being curious or ornamental. The annual kinds abound in the slovenly *Ar* cultivation of the Nagas; the terraced lands are comparatively free of weeds, being always kept under a regular course of cultivation. *Elephantopus scaber*, *Conyza*, several *Tagetes patula*, *Artimisia species*, *Eupatorium species*, were frequently met with; *Siegesbeckia species* at Sumooguding. *Achillea purpurea*, *Eclipta parviflora* ? and a species of *Artimisia* are found on the terrace walls at Mazamah, and above the terraces a most gigantic thistle, *Carduus species* ? very thorny, and growing to the height of ten feet and upwards. This plant is found also at Takajamamass: I gathered several specimens of it, but the rain which fell at the end of January, when my collections were on the way from Dheemapoor to Golaghat, destroyed them all. A large woody *Compositæ* is found at Sumooguding and at Kangsing.

LABIATÆ.—Species of the genera *Ocymum*, *Phlomis*, *Plectranthes*, *Mentha*, *Salvia*, and *Ajuga*, are commonly found about most of the Naga villages, but the most conspicuous plant of this order, and one that with its numerous red flowers makes the whole of the Sumooguding hill have a lively appearance at this season of the year, is *Holmskioldia sanguinea*. This is found also at Mezapamah, and occasionally near the Mikir hills. *Sesamum orientalis* is cultivated by the Nagas, and occasionally by the Assamese: it is to be found at Luckimpoor, where is also to be seen an elegant species of *Gomphostemma*.

VERBENACEÆ.—Of these I observed but few on the Angami hills, the most interesting were *Clerodendrum leucosceptrum*, *C. siphonanthus*, and *C. nutans*, the latter is common on the banks of the Dhunsiri, above the falls of the Nambin, in Tooleeram's country, and all

along the banks of the Jumoona. *Vitex Negundo* and *arborea*, with several species of *Callicarpa*, *Premna*, and *Clerodendrum* are found all over the plains in abundance.

BIGNONIACEÆ.—*Bignonia cauliflora*, *suaveolens*, *chelonoides*, and *Buidica* are indigenous to the Naga hills, the latter two are common in the plains. *B. glutinosa* is found at the Jumoona falls.

CYRTANDRACEÆ.—Plants belonging to this order are plentiful about Dibrooghur and Saikwah.

ACANTHACEÆ.—*Thunbergia grandiflora*, which is found all over Assam, is also indigenous to the Angami hills. In a ravine below the village of Sumooguding, I found *T. coccinea*, branches of this plant bearing red flowers, were intermixed with branches bearing yellowish-white flowers, but the tree over which they were spreading, having been cut down, and the branches of the creeper separated from the root, I was unable to ascertain whether both kinds sprang from the same root or not. I saw the plant at several other places, but did not again observe the white flowers. This species is plentiful about Rungagora and Saikwah, where the flowers are highly colored, while the flowers of *T. grandiflora*, or the indigenous plant, have very little color in Assam, and near to, and on the hills are pure white. The genus *Goldfussia* is common in all the ravines, and *G. nobilitata* is found growing in the vicinity of all Naga villages; but the only plant of which the Nagas appear to make any use is the *Rom* of the Assamese, of which they make a good blue dye. This plant was brought to the notice of the Commissioner of Assam in 1835 by Mr. Hugon, as we learn from an allusion to it in the Agricultural Society's Transactions, Vol. 2, page 219, where in a note it is called *Ruellia carnosa*, but by what authority I know not.* The *Rom* is

* We believe on the authority of Dr. Wallich. Specimens of this dye, presented by Major Jenkins in 1835, and again in January last, are in the Society's Museum. It is no doubt the same description of dye as that alluded to by Mr. Griffith in his "Journal of a visit to the Mishmee hills in Assam," (Journal Asiatic Society for 1837, page 326.) "At this village [Palannaw] my attention was first directed to a very valuable native dye, the *Rom* of the Assamese; with this dye all the deep blue cloths, so much used by the Kampteas and Singphos, are prepared. What is more curious it belongs to a family (*Acanthaceæ*) the constituents of which are generally devoid of all valuable properties—it is a species of *Ruellia*, and is a plant highly

abundant in the Dheemapoor forest, and is cultivated by many of the Nagás. Besides those already enumerated, the following genera are plentifully distributed all over the plains, the unexpanded flower spikes of several are eaten as *Hak* by the Assamese, *Strobilanthes*, *Ruellia*, *Barleria*, *Phlegacanthus*, *Eranthemum*, and *Justicia*.

SCROPHULARINÆ.—The most common and most conspicuous plant of this tribe, which is to be met with in the vicinity of the hills, is *Buddlea Neemda* or *B. paniculata*. The genera *Torenia*, *Gratiola*, *Capraria*, *Dodartia* and *Scutellaria*? are common everywhere in the plains.

SOLANÆ.—The thorny plant *Solanum Jacquinii*, together with *Physalus minimum*, *Sindicum*, *S. pubescens* and *S. hirsutum*, are indigenous to the Angami hills, the latter mentioned plant is plentiful at Mazamah, where the berries are largely eaten by the Nagas. *Capsicums* are largely and tobacco sparingly cultivated by the Nagas. In the plains the genus *Solanum* is abundant, from ten to fifteen species being common. *Datura* is found in villages.

GENTIANÆ.—A very pretty trailing plant: a species of *Pladera* is common all over the Naga and Mikir hills, and in the plains we have the genera *Exacum* and *Villarsia*.

APOCYNÆ.—This family does not appear to be so abundant on the hills as in the plains. *Nerium grandiflorum*, *Echites macrophylla*, *E. acuminata*, and *Ichnocarpus frutescens*, are found on the Naga hills, most abundant in the ravines. On the summit of Namsang, near the Dikho, I found *Beaumontia grandiflora*, but that was the only individual plant I have seen of that powerful climber. The genera *Echites*, *Tabernaemontana*, *Alstonia*, *Ophioxylon*, and *Strichnos*, are abundant in the plains, especially in Muttock and Luckimpoor.

ASCLEPIADEÆ.—Of these the most interesting plant that I met with on the Angami hills is *Marsdenia tinctoria*, Brown. The Nagas who

worthy of attention." It would appear to be also common to the Tenasserim Coast, on the authority of Mr. O'Riley, who states, that it is "in general use with the natives, who keep small patches near their houses, and make use of the leaves and tops of the plant; its produce is considered superior to No. 2 [*Marsdenia tinctoria*], and equal to No. 1," [*Indigofera tinctoria*].—Journal Agri-Horticultural Society, Vol. iii. p. 232.—Eds.

call it *Kelia purr*, plant it about their villages, and extract a blue dye from the leaves. Dr. Roxburgh describes this plant in the 2nd Vol. of his *Flora Indica*, page 43, under the name of *Asclepias tinctoria*, and says: "The leaves of this plant yield indigo, as mentioned by Mr. Marsden, and by Mr. Blake, in the first Volume of the Asiatic Researches. I have also extracted it from them by hot water. The few experiments I have yet made, do not enable me to say positively in what proportion they yield their color, but it was of an excellent quality, and as the plant grows very readily from layers, slips or cuttings, I think it very well worthy of being cultivated; particularly as it is permanent, like the *Nerium*, so that a plantation once formed, will continue for a number of years, and if we are allowed to draw a comparison between the leaves of this plant and those of *Nerium tinctorium*, the quantity of color they may yield will be in a larger proportion than from the common indigo plant. Since writing the above, I have learned that this plant is a native of Cooch Behar, and I have had some of the plants sent me from thence, also from Pegu, from whence I have likewise received plants. Some more experiments I have made with the leaves confirm what is above related, not only respecting the quality of the indigo, but also that the proportion is considerably greater than is obtained from *Indigofera tinctoria*. I have therefore warmly recommended an extensive cultivation thereof."

All this is fully borne out by the reports and practice of the Nagas, who speak of the *Kelia purr* as being a very valuable plant, they extract the coloring matter by boiling the leaves in a common earthen pot or in a bamboo *choonga*.* Several species belonging to the genera *Asclepias*, (of Roxb :) *Cryptolepis*, *Hoya*, *Dischidia*, and *Calotropis* are common in the plains. *A. curassavica* I found growing apparently wild in a deserted Naga village, on the Tokap-hing hills.

OLIENÆ.—Several plants belonging to this tribe are indigenous to the Naga hills. The genera *Phillyrea*, *Chionanthus*, and *Chondropspermium*, are found at Kangsing, Sarayen, and Sangtoong.

* "This plant is also found in the jungles [of the Tenasserim province], but not in any large quantity." See Mr. O'Riley's communication on certain indigo-giving plants of the Tenasserim Coast.—Journal, Vol. iii, p. 228.—EDS.

JASMINEÆ.—*Jasminum aristatum* is indigenous to the Naga hills, and several species of the same genus are common in the plains.

TAXACEÆ.—The only plant belonging to this family which I have actually seen growing, is a species of *Podocarpus*, this is found at Luckimpoor and also at Dibrapoor. "

SCITAMINEÆ.—Of these, the Ginger is the most important plant with the Nagas, and is largely cultivated by them. This family is spread all over the plains, where we have the genera *Zingiber*, *Curcuma*, *Hedychium*, *Costus*, *Alpinia*, *Globba*, *Phrynium* and *Canna*.

PALMÆ.—The most common palm on the Angami hills is a species of *Wallichia*, which is found on the first range of hills from Jeypoor to Sumooguding, also on the Mikir hills and at Luckimpoor, *Livostonia Jenkinsii* is indigenous to the Naga hills, abundant between the mouth of the Namsang and Towiouk, and about Namsang, Langta, and Kangsang: between the Dikho and the Dyung two or three species of *Areca* are also indigenous, one species of *Licuala* and *Calamæ* innumerable.

The *Pontederæ*, *Liliaceæ*, *Commelineæ*, *Pandaneæ*, *Pistiaceæ*, *Smilacæ*, *Dioscoraceæ*, *Aroideæ*, *Gramineæ*, and *Filices* are distributed very plentifully all over the plains. Of *Aroideæ* one species of *Arum* is peculiar to the hills, and is largely cultivated by the Nagas, both for their own consumption and for importation into Assam, Naga, Kuchoo. Of *Gramineæ* a species of *Coix* is cultivated on the Angami hills, from which the Nagas prepare an intoxicating liquid. Fine specimens of the gigantic Fern are to be found in the ravines; and on the terrace walls at Mazamah several species of Lichens are growing in abundance.

Dried specimens of all the plants herein enumerated accompany this memoir.

The cultivation pursued by the Nagas at Sumooguding is carried on in a very slovenly manner, principally at the foot of the hills on the Assam side, or on the lower hills adjoining that on which the village is situated. In them they cultivate rice, ginger, *Kemchoo*, leeks and capsicums; cotton and tobacco also in small quantities. The slopes of the hills in the vicinity of Mazamah present a pleasing appearance, being laid out in a terrace-like manner, the soil rich, apparently well cultivated, and plentifully supplied with water from springs near the

summits of the hills. The terraces are of different breadths, advantage having been taken of the large blocks of sandstone on summits of rocks, to form the divisions, and the linear spaces between are filled up with loose stones and smaller blocks, so that some of the terraces are five feet wide, and some ten or fifteen feet wide. Last year the ground on the higher portion was sown with *Coix*, and that of the lower with rice, and judging from the appearance of the straw, there must have been an abundant crop. The whole of the terraced ground is clear of shrubs and small trees, but a few large trees have been left, these have been headed down and form pollards.

At Takajanamah, a similar system of cultivation is pursued, though not to the same extent, nor in such a business-like manner as at Mazamah.

GEOLOGICAL SPECIMENS.

I saw very little that appeared to me interesting in geology on the Angami hills, scarcely any thing but sandstone of different degrees of compactness, from soft and friable to hard.

The following specimens will show the nature of the rocks met with on the route :

No. 1. This is a fragment of one of the sandstone pillars in the old fort of Dheemapoor. For a description of the pillars see Captain Butler's Journal.

2. Fragment of a sandstone rock from the NE. side of Sumooguding. A great portion of the hill is composed of this description of rock.

3. Fragment of a more compact stone found on the top of Sumooguding. Many large blocks of this description are lying loose on the summit of the hill.

4. Fragment of a tombstone from Sumooguding. The four show the different kinds of rock that are to be met with at Sumooguding and along the banks of the Dibboo. No rocks or stones are found in the bed of the Dhunsiri between Golaghat and Dheemapoor, except such as flow out of Dibboo Mookh.

5. Fragment of foliated clay slate, of which the hill of Prephima is composed. This specimen was procured from a ravine below the village, where the strata are nearly perpendicular. The rock differs in compactness at different points, when exposed to the action of the

air it crumbles down with the least touch ; at other points where protected, it is more compact, like the specimens, and large flags may be procured.

6. Fragment of one of the rocks common at Mazamah. Of this description of rock the terrace walls are formed in the rice fields. These are the only kinds I observed on the Angami hills. I saw no iron, salt, coal or lime.

COAL.—The following specimens of coal were collected from the different localities mentioned below.

7. Coal from the Jumona falls, highly impregnated with sulphuret of iron, and liable to spontaneous combustion. The spot from which this specimen was procured is about half a mile above the falls, and five yards from the Jumona river. The seam is eighteen inches thick. The sample alluded to in the Coal Committee's Report for 1845, p. 39, and said to be "one of the purest and finest coals hitherto met with anywhere," was a detached piece of coal, picked up by Mr. B. Wood, among the rocks at the falls ; from whence it came has not yet been ascertained.

8. Coal picked up in the bed of the Soondree, in the Luckimpoor district. Small bits of coal are found scattered over the bed of the river from the mouth of the Jeehing to beyond the first range of Duphla hills. No trace of any seam or accumulation in any part of the river visited.

10. Coal formation from the bed of the Soondree.

11. Coal from Jeypoor. Jeypoor is the only known coal locality to which boats can have free access without risk or obstruction. In the Desang there are stiff rapids to be encountered below the coal of Borhot. In the Suffry the rapids are more numerous, and the navigation more difficult than in the Desang. In the Dikho there are upwards of 20 small rapids between the Suntook Mookh and the coal.

LIME.—12. Fragment of a large block of shell limestone from the falls of the Nambin, very plentiful.

13. Fragment of a large block of compact limestone from the falls of the Nambin.

14. Fragment of a limestone boulder from the bed of the Hirrio Jan.

15. Limestone boulders from Soonpoora. These are found thinly scattered over the numerous quartz and granite boulders in the bed of the Brahmapootra, above Noa Dehing Mookh. They appear to be brought down by the Digro, as they are more numerous near the mouth of that river.

16. Limestone boulders from a little below the Koond. As we ascend the river, the boulders become larger, some of them consisting of pure white marble.

IRON.—17. Clay from Golaghat, containing granular iron ore.

18. Sulphuret of iron from the Jumoona falls.

MISCELLANEA.

19. Pipe clay from the Nambin falls.

20. Pipe clay from the Jumoona falls.

21. Fragment of a rock near the hot spring *Burra Noongpoong*.

22. Fragment of a rock at the Nambin falls.

23. Fragment of a rock forming a rapid in the Hirrio Jan.

24. Fragment of a rock on the Tokaphing Naga hills.

25. Fragment of a rock at the Jumoona falls.

• 26. Fragment of a rock on the Mikir hills.

27. Fragment of a rock on the Mikir hills, Jumoona falls.

• 28. Sandstone from the first hill banks of the Soondree river. Clift nearly perpendicular.

29. Sandstone from a high clift about three miles above No. 28.

30. Conglomerate forming faults? in the high clifts of Nos. 28 and 29.

31. Fragments of granite boulders from the bed of the Soondree.

32. • Fragment of the rock at the Brahmakoond.

Remarks on certain varieties of Sugar-cane in the Nursery Garden of the Agricultural and Horticultural Society ; with a few hints for their cultivation. By Mr. JOSEPH D'CRUZ, Head Gardener of the Society.

To JAMES HUME, Esq., Honorary Secretary to the Agricultural and Horticultural Society of India.

SIR,—Having been requested by Mr. Blechynden to draw up a few notes regarding the descriptions of cane in the Society's nursery garden, and add such practical hints on their culture as an experience of nearly nine years might suggest, I have the honor, in compliance therewith, to submit the following observations, arranging them under separate heads for the sake of a readier reference.

VARIETIES OF CANE.

Mauritius, commonly called Otaheite.—This variety was introduced into the Society's garden in February 1838 from Colonel Sleeman's plantation at Jubblepore.* It had been, I believe, previously introduced from Bombay and other quarters, but that stock has long since disappeared. It excels the red Bombay cane, so extensively cultivated by the natives, both in size and quality; yields one ratoon crop, and sometimes two in a rich soil; but high moulding is necessary, as the roots get considerably above ground. I find these ratoon canes answer for propagating when carefully selected. Those especially with vigorous eyes and full in the neck or top make excellent cuttings, and I should think it desirable, were a few beegahs of ground always set apart in large plantations, expressly for increasing the stock from such canes. A ratoon crop of this variety, I should imagine, to be little suited

* This plantation was raised by Colonel Sleeman from a small supply of cane brought by him from Mauritius in 1827. The cane sent to the Society averaged nine feet in length, and six inches in circumference.

for the mill, seeing that it becomes hard, close jointed, full of lateral shoots; giving much less juice than the first year's plant! This Mauritius cane, as grown in the Society's garden, averages from nine to ten feet in length, and from six to seven inches in circumference. The picked canes of a season have been twelve to thirteen feet long, that is to say, from the root to the top of the leaf joint; seven to nine inches in circumference, and from twelve to fifteen pounds in weight.

Straw-colored Otaheite.—This variety, the genuine Otaheite, was received in November 1840,* together with some canes of a purple variety. A few hundred of the latter sort have been distributed, and it is still under cultivation on a limited scale; I have had no opportunity of testing its quality; but from its general appearance, I consider it to be worthy of notice. The former sort has been largely increased since its introduction, and distributed extensively under the name of *Straw-colored Otaheite*. An experience of several years leads me to the conclusion, that this cane is superior to any other cultivated in the Society's garden, or indeed any other that has come within my observation. It is easy of culture, hardy, and exceedingly prolific; which of course adds to its value. It needs less labor for watering, replacing dead cuttings, and pulverizing holes, than other foreign sorts. When first introduced, I planted out one beegah of ground; it gave a magnificent crop of plant cane, and four ratoon crops. The third and fourth years' ratooning did not yield so many canes as the first and second; nevertheless it gave a very fair return. After the fourth year it was determined by the Committee that the ground which this cane had occupied for four years should lie fallow for a season, but before I could remove the stoles for that purpose, numerous healthy vigorous shoots had again sprung up. It is not probable

* They were shipped from the Island of Otaheite in May 1840, on board H. M. Sloop *Favourite*, by which vessel they were taken to Sydney, and brought on from thence to Calcutta by the *Charles Jones*.

that these rattoons of the fifth year, if allowed to remain, would have given a crop of equal extent with the preceding season; but it shows how naturally hardy and prolific this variety must be. The finest plot at present in the Society's Nursery consists of this *straw-colored Otaheite*. Two beegahs in particular, which were newly planted out in October last, will yield, I calculate, during the first cutting season, that is, from the close of September to the end of February, not less than ten thousand canes. Fully 95 per cent. of the cuttings put down in October sprouted; and more healthy, finer looking canes than are to be now seen in this plantation could not be witnessed. This variety is somewhat inferior in size to the Mauritius cane, but it gives more juice, and is altogether richer in saccharine matter. For these reasons I should certainly recommend to all those interested in sugar manufacture, and who grow their own cane, to give a preference to this variety; and, where the climate and soil admit, to cultivate it much more extensively than any other description.

Singapore Cane.—This variety was sent to the Society from Singapore in 1837 by Dr. W. Montgomerie. In June 1837 Dr. Montgomerie sent the first supply, the second in the October following. In his communication advising despatch of the latter, Dr. Montgomerie observes, that he has not been able to obtain any thing satisfactory relative to the origin of the canes grown at Singapore; “they form part of the *sea-stock* of almost all native vessels, and as we have communication with all the East by such means, we may have got them either from Siam, Borneo, Celebes, Java, or any other neighbouring country. The natives recognize the red or purple cane, as the “*Tuboo*” Malacca, pointing out Malacca as the place of origin, but they think the three light colored varieties, viz.: *Tuboo Leab*, or *Leab Tuboo*, and *Kapiun* have been introduced by the Buggeese traders from the Eastern islands, and in such case they may most probably

be a variety of the Otaheite cane, modified by the Malay, which may have been cultivated by the natives."—[*Transactions Agr. Hort. Soc. of India*. Vol. v. p. 66, Appendix.]

There is a material difference between this cane and other sorts. It is more transparent, and perhaps handsomer looking, than most other kinds in the Society's garden, and is, I am aware, held in much esteem by several planters. It is of a light-yellow color, averaging in height from eight to ten feet, and from four and a half to five inches in circumference. It has a light-colored, short, broad leaf, with a broad white stripe down the middle of the leaf, which serves to distinguish it from other sorts. Its cultivation is however precarious. It suffers more from the ravages of jackalls, who are extremely partial to it, than other sorts. It is also easily blown down by high winds, and when once prostrated it is difficult to raise it again, its natural brittleness causing it to break into pieces. Other canes are, of course, more or less subject to the same casualty, but I have seldom experienced any difficulty in raising them up again, and securing the greater portion. It might be worth the while of parties desirous of growing this particular variety, to make an experiment for counteracting the effect of the wind by planting China cane very thickly in borders, eight or ten feet wide, all round the plots in which the Singapore sort is to be cultivated. I have never tested the efficacy of this experiment, as there has been no occasion for it, the quantity cultivated in the Society's garden being on a comparatively small scale, and merely for the purpose of distribution; but I have been induced to offer the suggestion as possibly an easy and simple mode of securing a really fine variety of cane, during the period of its growth, against a stiff breeze or sudden blast of wind. I should mention that the red or purple sort alluded to in the previous page, was also increased, but being afterwards recognised as identical with the red Bombay variety, its culture was discontinued.

Batavia Cane.—This variety, though introduced from Bourbon by M. Richard in February 1838, as Batavia cane, was, by some mistake, cultivated under the designation of *Striped Bourbon*, by which name it has since been known and distributed. I have little to say in its favor. So far as my experience extends, I believe it to be inferior to the other varieties. I have found plants from the ratoon crop to be always very hard, and to yield but little juice. It is striped with green and dark blood-red, and grows on an average to the height of about eight feet, and from three and a half to four inches in circumference. There has been a less demand for this cane than the other varieties, and consequently it has only been cultivated on a small scale.

China Cane.—Regarding this well known cane but a very few words need be added. It is the hardiest of all varieties, the white ant seldom or never touches it; its ability to stand all changes of season is also a great argument in favor of its cultivation. It yields several ratoon crops, and requires less care and labor than any other sort with which I am acquainted; though if a small degree of culture be bestowed; it repays the owner by an increased length and thickness. I may here mention that, in consequence of the demand during 1845 for this variety, being unusually great, and much more than could be met, the Garden Committee increased the cultivation to meet a probable large demand during the following season. About two beegahs were appropriated, and these manured previous to, and after planting. The canes on this plot increased generally one-half more than their usual thickness, while a few attained a circumference of more than three inches. During May and part of June of last year, when all the other varieties in the nursery suffered considerably from the exceedingly dry and hot weather then experienced, especially the Mauritius sort, the China cane looked as flourishing as ever, and not even a single plant was scorched by the great heat of the sun.

Several correspondents of the Society, have, I observe, lately borne witness to the capability of this cane to stand drought and heat. As the Numbers of the Journal in which their experience is recorded may not be available to every reader of this paper, it may not be amiss if I transcribe *verbatim* the remarks of these gentlemen. Mr. F. Nicol writing from Chandpore factory, Jessore, states,—when comparing this variety to certain others, which he had also cultivated on a small scale, in 1844,—“ the China cane thrived the best, and grew to a great height, quite overtopping all the others. Several plants measured nine feet high; the white ants did not touch it (though they attacked the Otaheite, Singapore, Bourbon, and *Dholee*), and it is certainly the best description for land at all invested by these destructive insects.” Mr. P. P. Carter, of Bhojipore factory, near Buxar, in a communication dated June 1845, observes—“ of the five descriptions of sugar-cane I obtained from the Society in March last, the China has succeeded so wonderfully in spite of white ants, heat, and every evil, from which the others (and even the country cane of the district) have suffered so severely, that I am very anxious to have some correct information of its qualities. Should it prove to be a good yielding cane, producing sugar of good quality, I would cultivate it in preference to Otaheite and every other description I know of. I am rather curious to know what height and thickness it attains at full growth, as from its present vigorous appearance it promises even to surpass the Otaheite, while the seeds were scarcely thicker than my little finger.” And Mr. S. H. Robinson, writing shortly after from Dhoba, near Culna, remarks—“ of all the varieties of cane I have tried, the China has proved by far the hardest, in surmounting the attacks of white ants, heat and drought, and it has yielded me a good crop at the rate of 202 bazar maunds of cleaned cane per beegah from the same situation in which Otaheite, and two varieties of blue cane, were all but destroyed by

invites the white ants) with the mould in the hole, and cover the cuttings about two inches deep, well pressed down, and water them immediately. Many failures have occurred in raising a healthy crop of cane by transplanting large plants nursed in shady places, which finally get sickly, and take a long time to recover, with loss of 25 per cent. in consequence of being torn up by the roots and exposed to the sun. Experience has sufficiently proved, that planting out cuttings at once is a more efficient and successful mode than any other: as the plants are allowed to shoot up and the roots to penetrate undisturbed. Indeed forcing the vegetation in the hopper is detrimental to the proper and gradual development of the cane.

In comparing the results of various modes of planting I find the *trench* system to be most effectual. The alleys serve as shelter for young plants, aid to keep the trenches moist, facilitate irrigation, and require less watering before irrigation, perhaps twice a week, and thus entail less expence compared to the *square hole* mode. It (*square hole*) is difficult of irrigation on account of the space betwixt the holes requiring to be cut for conveying water from one hole to another; besides a full exposure to the sun dries up the moisture, and watering must thereby be resorted to every other day, which adds considerably to the expence.

Manuring.—The manure I have found to be most beneficial to cane is a composition of mustard oil-cake, tank earth, rotted cow-dung, vegetable mould, slack-lime, and *seetee*, to be applied according to the following direction, viz: collect all the *seetee* (refuse from indigo vats) available on the ground under preparation, and plough it in two or three times; afterwards strew slack-lime at the rate of four maunds per beegah, and plough it in several times until the ground is thoroughly prepared; and the two ingredients well amalgamated with the soil. Afterwards cut trenches and plant cuttings as above described, with a handful of mustard oil-cake, which serves

to drive away white ants and destructive insects, and eventually answers as an exceedingly rich manure for cane. I may here observe that the white ants proved very destructive to the cane in the Society's nursery during the first and second years after the formation of the plots. From that period (1838) to the present time, we have been very little troubled with them, so little indeed as to be scarcely worth mentioning. No doubt constant cultivation has aided in keeping them away; but I should say that this frequent use of mustard oil-cake, coupled with an occasional sprinkling of slack-lime, have also materially assisted in preserving the plants from the ravages of this destructive insect.

Weeding, hoeing, irrigation, and general treatment.—Keep all the trenches clear of weeds and grass, especially *Kashiya* grass, (*Saccharum spontaneum*) which throws out to a great extent long thick roots, and absorbs most of the moisture, and is injurious to plants in general. The surface weed is not of much consequence, it can be cut with sickles, dried in the spot and burnt. When weeding, examine those cuttings which have not sprouted, and in case of failure, replace. About January the plants will be a foot or so high; give them then a surface digging and general irrigation. After this process, with the view of improving its growth, pulverize the earth round the young cane-roots when the soil is moderately moist, and will not stick in the weeding hook. About the beginning of March the plants will be sufficiently strong to bear any quantity of manure, (it is hardly possible to make the ground too rich or to over-manure cane plants) when put a couple of handfuls of oil-cake and a composition of cow-dung, vegetable mould, and tank earth (if procurable), half a basket round each cane stole, and irrigate the whole plantation. Give another surface digging, partially filling the plants about two inches at the same time, and covering up the manure so recently applied. About the middle of April, if there be no shower, the plantation will again require

irrigation, digging, and weeding. After the first heavy shower in May, set all hands at work in filling up the trenches with the earth previously kept on the alleys, and level the whole plantation, denuding it of all weeds and grass. From the beginning of June to the middle of July the moulding must be all finished.

June moulding.—Apply a couple of handfuls of well powdered oil-cake round each cane stole after stripping off the dead leaves: care must be taken not to hurt a single green one, as great injury is frequently done to young cane by so divesting it. I have omitted to mention that about four maunds of oil-cake will be quite sufficient for one beegah, if it be judiciously applied from the commencement to the last application. After manuring and removing old leaves, mould the cane with the earth in the alleys, (which will afterwards serve admirably for drainage) about six inches high, and see that no vacancy is left between the canes, but that all are properly filled.

July.—When the canes are about a foot above ground, trash and tie them by means of rope or twisted leaves to support one another, leaving sufficient space to admit light and circulation of air; then mould them to strengthen the roots. I recommend no cane to be trashed or moulded until it obtain the above height, otherwise there is every probability of preventing its growth. It will require three or four trashings until cane-cutting, and this must be carefully done, as a great deal depends on the operation being properly performed.

Cutting.—The period of cutting will of course depend upon the quality of the soil and description of manure employed. Following the process above-mentioned, and planting from the 15th of October to the 10th of November, the canes will be fit for cutting in the following November and December, if required for manufacturing purposes. If wanted for propagating, the canes should be cut in October or the early part of November. If delayed beyond that time, the eyes

generally die away from the lower part to the middle of the cane, thereby causing great loss.

Before concluding this paper I beg to add, by way of record, the following list, showing the number of canes that have been distributed from the garden from the period of its formation to the present time:—

Season 1839-40,	40,054
„ 1840-41,	12,850
„ 1841-42,	50,467
„ 1842-43,	4,230
„ 1843-44,	12,150
„ 1844-45,	5,325
„ 1845-46,	39,354
„ 1846-47,	44,000
Total,	208,430

The greater part of this cane has been distributed throughout the various districts of Bengal and Behar, while a small proportion has been sent to Cuttack, Arracan, the Tenasserim Coast, Madras and Ceylon.

•H. C. Botanic Garden : 9th August, 1847.

Note on some of the Dye stuffs in use in Upper Assam. By Major HANNAY.

[Communicated by Major Jenkins.

I have been endeavouring since the receipt of your letter, to make a collection of the different dyes used by the people on the Frontier, but have not succeeded—with the exception of two or three named in the margin—in finding any thing new, and at present I am not able to procure any of the *Rom* or wild indigo in a consolidated state, as the people do not understand this process with regard to any of their dyes, and I must therefore look forward to getting a good sample at some future period. In the meantime I send you a piece of *Mooga* silk, the thread of which is dyed with the different ingredients enumerated in the margin. All of which are known,

I believe, with the exception of those marked with an asterisk. As you are acquainted with the botanical names of the plants furnishing those dyes, you can correct them if I am wrong in those I have given them.

1. *Indigofera tinctoria* and *Anil*.—Indigo of Bengal, two kinds, one with a very small leaf, and another leaf rather larger.

2.* *Coptis Teeta*, Wall.—*Mishmee Teeta*, described by the late Dr. Griffith.

3.* A plant called by the Shans *Khac Khew*, is a creeper, and grows on the banks of the Nao Dehing.

4. *Ruellia*.?—*Rom*, called wild indigo, described by the late Dr. Griffith.

5. Leaves of the *Bomruttee*, a handsome flowering tree, I believe a *Monocera*.

6. Fruit of the *Tekera* or *Tekra*, a tree which I think Mr. Masters calls a *Garcinia*.

7. *Bixa Indica*.—Coloring matter of the *Bixineæ* seeds, commonly called *Arnotta* or *Anotto*.

8. *Morinda tinctoria*.—*Assoo Khat* of Assam, *Seing Laing* of the Singphoos.

9. *Munjeet*.

10. Coloring matter of the lac.

The principal, and I believe the best dyers on this frontier, are the Phakeals, a tribe of Shans, who have been settled for two generations in Upper Assam, and who, like their brethren the Laos and Shans on the eastern borders of Ava, have preserved the art of dyeing party-colored garments from time immemorial.

The piece of stuff now sent, must not however be taken as a first rate sample of Shan dyeing, for the productions of the Lao Shans are exceedingly beautiful, both as regards the texture of the silk and the excellence of the colors: the same may be said also of those handsome patterns of party-colored silk garments called a *Patsoe*, worn by the Burmese nobility

and wealthy classes in the Burman capital, and which are the manufacture of Shans residing in Ava, or of the Cathays or Mancepoorees, who are a numerous class of the population about Amcerapoora, and originally a branch of the great Shan nation: hence their knowledge in the present day in the art of weaving, dyeing, and lacquering.

The females of the Shans are the weavers of all cloths worn by these people, and excepting in large towns, where a man is a dyer by profession, the women dye all the thread used in their own villages. The colors of the accompanying sample are very sombre, but the Shans, who have not adopted the fashions of Burma, are fond of these dark-colored patterns. I have seen a similar pattern common in and about Bamo, north of Ava, the men however wear a checquered silk, generally different shades of green, the striped pattern being worn by the women as *tamsins* or petticoats.

The following is the method adopted in dyeing the colors in the piece of cloth now sent, and it is necessary to state, that the thread is entirely *Mooga*.

Black.—A good black is given to both cotton and *Mooga* thread, with indigo or the *Rom*, the last is the best. The stuff has to be dyed (in a preparation, and these colors made in the usual way), and washed frequently before the proper degree of intensity can be obtained. With *Mooga* thread the process has to be repeated ten times.

Blue.—The different shades of this color are given with either of the two last mentioned colors.

Green.—This color is obtained by dyeing the thread blue, and afterwards dyed in a preparation of the "*Mishmee Teeta*" No 2, (i. e. the *Mishmee Teeta* pounded and boiled with a certain quantity of water) or in a similar preparation of the twigs of the creeper No. 3.

Olive-yellow.—This color is given with a preparation of No. 2 or No. 3, either will answer: the thread has to be steeped three times.

Indian Red.—The thread is first well saturated in a decoction of the fresh leaves of the *Bomruttee* No. 5, after which it is dyed with a preparation of *Munjeet* No. 9, or lac dye No. 10; either will answer.

Purple Madder.—Is given by dyeing the thread first in a preparation of lac dye, and afterwards with indigo or *Rom*.

Red Lilac.—This color is given by saturating the thread in the water well strained from lac dye, a decoction of the *Bomruttee* leaves, and the water well strained from the bruised fruit of the *Tekra* No. 6, these are heated together, and the thread steeped until the required color is obtained.

Orange.—The foregoing are the colors given to the sample of *Mooga* now sent. An orange color is given to silk or cotton with coloring matter of the seeds of the *Ruhoom*, or *Bixinia*, No 7, boiled with common wood-ash.

Indian Red.—The different colors of this, which we see in the chequered cloths worn by the Dhoannies and Singphos, and manufactured of cotton, are given by preparations of the *Assoo Khat*, a purple tinge being given with lime, which last however the Phakeals do not use. In giving this color the thread is first boiled in oil and wood-ashes, and afterwards washed or boiled in clean water, and dried in the sun, and allowed to remain for about twenty days, when it is again well washed in hot water, and steeped in a preparation of the *Bomruttee* leaves, when it is dyed with a preparation of the *Assoo Khat*, and afterwards saturated in the water from wood-ashes.

The Phakeals improve the appearance of the color from *Assoo Khat* very much by weaving a thread of blue, cross-ways through the “Indian red,” which gives an appearance of being shot. They do not know of any other black but that from the indigo. The Shan “black vegetable dye,” which has been so much spoken of, is not known to them. It may be as well to mention, that when I was at Ava, the late Colonel Burney made many enquiries about this dye,

and a Shan dyer of Ava, who used to come to the Residency, produced a small green fruit, about the size of an Indian plum, which he said gave the black dye, and from what I recollect of this fruit, it appeared very like a common and well known fruit, that of the *Heeleeka*, or *Terminalia citrina**, which is well known in Assam, at least to give under certain preparations, a very fast black dye. I believe the method is to boil the bruised fruit either in an iron pan or with a mixture of iron filings. I mention this because I recollect that in analyzing the black dye brought to notice by the late Mr. Landers, it was found to contain a quantity of ferruginous matter.

The beautiful red color which we see the Nagas dye the goat's hair, and with which they decorate their persons and arms, is given entirely with the *munjeet*, of which there is abundance in the higher ranges. The yellow color is a grass found in the Naga hills, and is plaited into armlets, and other ornaments for the head, ears, legs, &c. along with shreds of rattan dyed red with the *munjeet*, and the black with a preparation of the *Heeleeka*, *jamoon* bark, and afterwards buried in mud. The Nagas do not dye their cloths, what they wear of colored stuffs is procured from the plains and Jorehath, where a quantity of black and blue coarse cotton *chudders* are brought to market by those Nagas who cultivate cotton.

Of the creeper which gives the yellow dye, and the straw used by the Nagas, I hope to be able to procure a quantity by and bye: the leaves of the former, I shall endeavour to get also.

Jeypore: 3rd March, 1847:

* The fruit which Mr. Landers brought to the notice of the Society belongs to a species of *Diospyros*, *D. Moles*, Griff. See Journal. Vol. iii. p. 143, for a drawing and descriptions of this tree.—*Eds.*

Hand-book for the Cultivation and Manufacture of Tea in Java.
 By J. J. L. L. JACOBSON, Knight of the Order of the Netherlands' Lion, and Inspector of the Tea Cultivation in Java.

[Translated from the Dutch by R. W. G. FRITH, Esq.]

[Continued from page 224 of Vol. V.]

CHAPTER XII.

On lopping the Trees.

192. The tea plants or shrubs must be lopped, so as to keep them to a certain height ; by keeping them down in their growth they are fine in wood and tender in the leaf ; and then when they bud about the time of gathering, they are found to be not more than two and a half to three feet high, which to the pluckers is of great advantage.

193. Lopping the trees prevents the superabundant budding of leaves ; planting with several seeds, and especially with these in the pod, has already acted against the excessive development of the shoots, these two methods combined, produce fine thin shoots and tender leaves, and the repeated loppings cause the plants to spread out.

194. By lopping is meant the clipping or pinching off, not cutting off, all the young shoots without any exceptions, to half or one inch under the brown wood, and if it be necessary scissors should be used ; if the shoots thus lopped off, again bud forth and are firm, the lopping is repeated.

195. The trees are first lopped when they are about a foot high, strong and healthy : seedlings reach this height when about seven or eight months old ; and plants from seeds after nine or ten months ; sometimes it happens that they are a month or so later, in that case the pruning must be also so much later ; pruning too early, too often, and not often enough, is pernicious ; three or four months after pruning, the fresh-grown shoots are again stronger, and firm enough for the pruning to be repeated. Before the first year of gathering, this takes place three and four and even five times, ac-

cording to the nature of the land ; the last time three or four months before the gathering commences ; after each pruning the shrubs are allowed to become somewhat higher, until they are brought to about two and a half or three feet ; the pruning should never be neglected during this period ; but after the second year it is discontinued altogether.

196. The leaves produced from each garden at the first pruning, must by a skilful hand be manufactured into black and green tea, and it must then be determined upon, which gardens are to be set apart for black and which for green tea ; this being done, the factories can be erected.

197. A portion also of the tea from the second pruning must be carefully manufactured, and from that must be decided whether any of the black tea gardens produce more than one quality ; the same with the green tea gardens ; this is necessary to be ascertained on account of the packing.

198. The leaves which are produced by this and the following prunings, serve to instruct the people in the plucking, shaking and manufacturing of the tea ; a matter of the highest importance towards the success of the undertaking.

199. Every pruning of 100,000 shrubs produces at least 200 pounds of tea ; five or seven subdivisions ought to be pruned at the sametime, thus the whole garden may be done in seven or five days ; in this manner the shrubs are kept more uniform, as well as leaves enough obtained, for instruction in manufacturing.

200. In pruning, the proper mode of holding the hands ought to be properly ascertained, as well as in what manner the collecting baskets are filled ; these baskets, likewise the racks, tampiers, &c. should be the first implements that are made.

201. Spare furnaces are also made of bamboos, plastered over with clay inside and out : further, they are formed, above, for black or green tea, as the ordinary furnaces. This kind is not advisable for large factories, but answers very well for planters who only work for about three or four days consecutively.

202. Spare furnaces need not to be erected for instructing the people ; a planter, although he may be very liberal in his disbursements of daily wages, must never incur expences that can possibly be avoided.

203. The instruction to the people, with the leaves which have been lopped off, must be given in one of the out-houses, or in one of the native luts, whichever is most conveniently situated for the planter, so that he may be present ; in these the two spare furnaces and materials are placed, and the people are then at once taught that the smaller planter is enabled to manufacture tea in his own house.

CHAPTER XIII.

On the Factories, the packing houses, and materials in general.

204. While no other tea is being manufactured except that from the lopped leaves, the materials, packing house, and as many factories as there are gardens laid out, should be got ready, in the proportion of one-third for green and two-thirds for black tea.

205. The factories should be built of bamboos, they are more airy for the leaves than such as are built of wood or bricks ; they take up moreover so much time in building, that the pruning, &c. &c. is apt to be neglected thereby, and the plantation suffers.

206. Every black as well as green tea factory is made with an open roof, is thirty-eight feet three inches broad by thirty-eight feet three inches long ; to the black tea factory must be attached two sheds with the usual kind of thatch, each twenty-five feet six inches in breadth, and forty-four feet seven and a half inches long ; in the one there must be twelve furnaces ; in the other shelves, &c. : all the buildings ought to be nine and a half feet high, clear under the roof. In the black tea factory a furnace is built with four flat (*kwalies*) iron pans : in the green tea factory one furnace with two flat (*kwalies*) iron pans, another with three sloping ones and two other small furnaces.

207. Factories built of bamboo materials, tend to increase the cultivation of tea, for the ryot then sees that he is in a position to procure means within his reach ; when he will no doubt endeavour to plant and manufacture tea himself.

208. It is desirable that the factories should enjoy the following advantages ; 1st, the one for black should be so situated that the sun may have free access to it ; and the one for green as little sun as possible : 2nd, that there is pure water close at hand to each factory, for washing the materials and for the use of the people : 3rd, that each be situated on the main road to the plantations, so as to be easily approachable by the planter : 4th, that each factory should be situated as nearly as practicable in the middle of each plantation for the speedier receiving of the leaves.

209. The packing house should be close to the residence of the planter, and that ought to be situated in the vicinity or in the middle of the plantation ; it is only intended that the tea should be temporarily stowed there, for the dryest packing house, situated at an high elevation, is damp ; therefore, as soon as there are twenty chests or (*krandgangs*) baskets packed, they ought to be immediately dispatched.

210. There ought to be in each packing house about ten cupboards or almirahs, one for each plantation ; but it may be possible that the plantation yields only two, three, or four qualities of tea, in which case there will be the less number of cupboards necessary ; old ones are the best to use.

211. The packing house must be two feet eight inches above ground, and if it is to contain ten cupboards, must be of the following dimensions—forty-eight feet long by twenty-five feet broad, and twelve and a half feet high under the roof, in which is included two feet eight inches of wooden piles, which must stand upon river stone : the building is made of wooden piles, with walls, bamboo mat-work, doubled, and closely and firmly put together, a roof of thatch grass, the flooring of planks, and further a verandah ten feet wide, floored with mats.

212. Concerning the quality and nature of the materials, there are indications and a certain state attainable, which afford the clearest ideas on this point ; most of them consist of bamboos, and some of iron, and altogether the cost is very trifling.

213. The planter ought to provide himself with an account of the uses of the materials necessary in the plantation.

214. The same regarding the erection of the factories and furnaces.

215. The same regarding the uses of the materials for the above.

216. Also the same, of that concerning the packing house.

217. The size of the factories and out-houses, as also the quantity of material that may be required is calculated at the production of one pound from ten shrubs ; should, however, one pound be obtained from five shrubs, then it will be necessary to reduce every thing by one-third, except the packing-house ; that remains the same.

218. The planter should endeavour, ere he commences, to have models made of every thing, and appropriate to his services the descriptions and drawings at the same time ; the principal part of the bamboo materials are made of the same kind of mat-work, and every year, before they are again taken into use, they should be washed clean, and further care must be taken that each kind is made precisely after one model, and they will then be uniform.

CHAPTER XIV.

On the Tea baskets and Tea chests.

219. After the tea is manufactured, it has still to undergo further operations and then be well packed.

220. For this purpose they have separate establishments in China ; in Java, at Mr. Cornelis', near Batavia, there is one of these establishments ; on account of the dampness, it is not advisable to have them in the plantations, they likewise interfere with the planter, when his object is to produce quantity as well as good quality in his teas ; the Chinese planter consequently thinks solely about the production and

manufacture, leaving the remainder of the work to be done by the others.

221. The teas are therefore delivered to the large establishments in large sacks, baskets and chests, but such as are not fit for exporting it in ; this is also done in Java, but there, no doubt, before long the planters will commence to deliver their teas in such chests as will be good enough to have the same exported in. . . .

222. The Chinese baskets are double, and all made of open-work ; between the two bamboo leaves are placed ; in Java the bamboo leaf is not so well adapted for the same purpose, and the baskets there are consequently made closely worked together, lined inside with the leaves, and over that again a thin paper.

223. The Chinese planter never packs fresh tea so as to exclude the air from it, as in that case it would not be freed from the *raw sharp* smell that it has, and it is for this reason that he uses sacks ; and the chests are sent with their covers open, and placed in open-work baskets, and then despatched ; some people assert that it is done to facilitate the inspection of their contents by the Customs' Officers.

224. The baskets must measure in diameter two feet two and a half inches, in height two feet seven and seven-eighths of an inch, the cover should not go deeper than nine and a half inches ; they will then carry as near as possible about 100 pounds of tea.

225. The *Bambootalic** and the *Bambootemon** produce the largest leaves, therefore they should be taken from these trees ; at first they must be placed in an out-house or shed to dry by the wind, to prevent their heating, and afterwards they must be placed, between two heavy planks, to make them smooth and even ; the tops or points must then be cut off about two inches, the leaves fastened together by small bamboo pins, making sheets of them of about two feet ten and a half inches square, when they must be again dried and laid, until required for use, between two heavy planks.

226. For each plantation there should be two men employed the whole year through for making baskets, as well as bringing the

* Particular kinds of bamboo.

bamboos ; they will be able to finish off in three days one or two baskets complete with their covers.

227. Each basket will require about six sheets of the bamboo leaves : two old women must be employed the whole year making these leaves up, and if they prefer it, they might be allowed to do so in their own dwellings ; they provide themselves with leaves, and ought to make up about four to six sheets daily.

228. The wood for the chests should be of a light description, not liable to rot ; and be moreover dry and without the slightest smell, for the green tea it should be of a light color, and that for the black of a dark color.

229. Tea chests for the European market must be light and strong, both as to wood and lead, also well closed, and with an air-tight, simple, although neat, and even sometimes of a flowered covering ; further provided with marks and inscriptions according to custom.

230. In China almost all the chests are made outside of the plantations, and such as are made in the neighbourhood have the outer covering done elsewhere.

231. In Java the practice ought to be to have the chests made in the neighbourhood ; with that view, the planter must bring up two of his carpenters as master carpenters in a separate establishment ; then they are taught the order and regularity of this trade, and are speedily enabled to instruct others.

232. He accordingly assembles together twenty men, that is, two from each plantation, in one of the out-houses, which serves as a place to work in ; the two master carpenters instruct the others, that is, the other eighteen men ; altogether they are enabled to make five chests each day, thus 1500 are made in 300 days ; strictly speaking, these twenty men, can with order and industry deliver at least 2,500 chests in that time, and that without any extra exertion on their part.

233. After the second pruning, the planter can tell what kind of tea his land is to produce ; he therefore generally requires to have ready two or three different sorts of chests on this account, the size

of the chests for each kind is previously determined upon ; each however will generally contain, more or less, about sixty pounds (Amsterdam measure), according to the size of the leaf. For 100,000 pounds from one plantation, that is, 10,000 from each garden, or from ten shrubs one pound, in an average about 1500 chests will be required.

234. As long as the manufactory cannot supply chests, the planter should endeavour to procure them elsewhere to carry on with ; these should be also of a certain size, which will contain more or less 100 pounds (Amsterdam) weight. For 100,000 pounds accordingly 900 will be required ; it is always however desirable, that such as are actually required be procured, and no use made of the fourth sort.

235. The four sides of the chests, must consist, two, of two planks each, and two of three planks each, the planks properly joined to each other ; or each of the four sides may be of one broad and one narrow piece of plank ; but so put together that the joinings of the planks do not come opposite to each other ; the tops and bottoms, although they cannot always be of one piece of plank, must never be of more than two breadths, and in the last case, the joining must never be in the middle ; in this manner small or narrow planks can be made use of in the making up of the chests. Planters, who may find it difficult to get wood-work done in the immediate vicinity of the factory, must procure ready-made planks, and of the proper dimensions for constructing the chests from some other source, so that at any rate they can have the chests made up at the factory and under their superintendence.

236. The leaden boxes are in the meantime delivered to the planter, according to an agreement already entered into, cut to the proper dimensions, folded up, and ready to be put together ; this is easily done, and they are placed in the wooden chests, according to the method pointed out for that purpose.

237. The wood and leaden boxes both can be made at the rate of florins* 83.71 cents each, or 1,500 in the twelve months, and florins

* One florin or guilder is equal to one shilling and eight pence sterling.

3.29 cents each, when 2,500 are made, and if the leaden boxes are made in the factory, these at florins 2.88 cents for 1,500 and florins 2.46 cents for 2,500, and even at a lesser cost.

238. The planter must always bargain to have the chests made, each at a certain fixed price, although he may employ his own people, although it may happen even, that by any unexpected exertion on their part, they may make them to a profit ; he is sure in that case, that they will be ready at a proper time ; it is therefore to his own interest to give the work into the hands of his own people. .

239. Finally it is of the utmost consequence with a view to the more general cultivation of tea, that the preparation of the chests goes on close to or adjoining the factory ; there will be less necessity for erecting expensive buildings, and the consequence will be a range of suitable packing houses, in all the residencies, or in the vicinity of the plantations.

(To be Continued.)

THE JOURNAL
OF THE
Agricultural & Horticultural Society
OF
INDIA.

On the Tea Plantations in Kumaon and Gurwahl, and on the method of treating the Tea Plant, the Manufacture of Black and Green Teas, with a short account of Implements used (with figures). By WILLIAM JAMESON, ESQ., Superintendent Botanical Gardens, North-Western Provinces.

[Communicated by the Government N. W. P.]

To the Secretary to the Agricultural and Horticultural Society, Calcutta.

Rev. DEPT. SIR,—I am desired to forward to you for submission to the Agricultural and Horticultural Society, and for publication in their Transactions, the annexed original report from Dr. Jameson, regarding the cultivation and manufacture of Tea in Kumaon and in Deyrah Dhoon. The document is sent in original in order to avoid the errors to which transcription would probably give rise. The drawings which accompany the report are also forwarded in original; and it is hoped that they too will appear in the Transactions.

2nd. The Lieutenant Governor will feel thankful if he can be furnished with a hundred copies of the article in a detached form, in order that they may be officially circulated in these Provinces. If the drawings should be found to involve more expense than the Society feel themselves warranted to incur, the Lieutenant Governor is prepared to bear a just portion of the charge.

3rd. It seems right to notice with reference to para. 41 of Dr. Jameson's report, that the Right Honorable the Governor-General has lately sanctioned the formation of a canal which will leave the Jumna near the village of Kutta' Phuthur, and will bring under irrigation the whole of the tract referred to. The scheme for this canal projected by Major T. P. Cautley, Artillery, will be found in Volume xi, of the Journal of the Asiatic Society, No. 128, for August 1842. It is hoped, that this canal will be in a state of forwardness during the approaching cold season.

4th. Measures are in progress for procuring fresh varieties of the seed of the tea plant from China, as recommended in para. 49 of Dr. Jameson's report.

I have, &c.,

HEAD-QUARTERS :
The 25th August, 1847.

J. THORNTON,
Secy. to Govt. N. W. P.

In the report that I am now about to submit for the consideration of the Honorable the Lieutenant Governor, it is my intention to show briefly what has been done since I reported generally in September 1845.* I shall then give an account of the method of treating the tea plants, &c. which may be useful, as suggested by the Honorable the Lieutenant Governor, to those about to enter on tea cultivation, and a guide to the overseers who have lately been appointed to superintend the plantations.

* For this report, see Journal, Vol. iv. page 173.—Eds.

2. For convenience sake, I shall divide the report as follows :—

PART I.

1st. Progress of the tea plantations.

2nd. Number of young plants fit for transplanting.

3rd. Quantity of tea manufactured, and future prospects.

4th. Sale of tea at Almorah, in July 1847.

PART II.

5th. Soil best adapted for the tea plant.

6th. Altitude above the sea best adapted for the tea plant.

7th. On the method of preparing ground, preparatory to forming plantations, viz :—*fencing, draining, ploughing, trenching, formation of roads or paths.*

8th. On seeds when ripe, and season and method to be adopted to ascertain it.

9th. On the method of sowing seeds, and on the treatment of the young plant after it has germinated.

10th. Method of rearing plantations, viz :—*By sowing seeds, by layers, by cuttings.*

11th. On transplanting and season.

12th. On pruning.

13th. On irrigation.

14th. On the tea plant; season of flowering; its character and species, and on the advantages to be derived by importing seeds from China.

15th. Method and season of plucking and gathering tea leaves.

16th. On the method of manufacturing black tea.

17th. On the method of manufacturing green tea.

18th. On packing tea.

19th. On the mode of preparing sheet lead.

20th. Buildings necessary for manufacturing tea.

21st. Implements required in the manufacture of tea.

22nd. Concluding remarks.

I.—Progress of the Tea Plantations.

3. The land under cultivation with tea, in Kumaonⁿ and Gurwahl, may now be estimated at above 162 acres, thus:—

KUMAON.

					<i>Acres.</i>
Russiali, ..	..	..	..	..	57
Bhurtpoor, ..	..	..	..	..	4½
Kooasur, ..	}	..	..	..	46
Annoo, ..		..	..	..
Lutchmisser, ..	..	..	..	..	3
Kuppeena, ..	..	..	..	..	4
Huwalbaugh, ..	}	..	..	..	30
Chullar, ..		..	..	..
					— 144½

GURWAHL.

Guddowli,	..	..	..	..	8
Kaolagir,	..	..	..	..	8
Kouth,	..	..	..	..	1
Rumaserai,	..	..	..	..	1
					— 18

Total, 162½

In addition there are 258,841 seedlings, &c., ready to transplant. It was my intention* last season to have added another plantation to the Almorah district, as it would have been under the immediate superintendence of the overseer stationed at Huwalbaugh, but owing to the difficulty of procuring land adapted to the cultivation of tea in the immediate neighbourhood of the capital of the province, it was not established. There are however plenty of lands available in the neighbourhood of Russiah and Kooasur for further extension.

4. I accompanied Mr. Commissioner Lushington to Bishnuth in September, being informed by him and Mr. Batten,

* See last report Journal Agricultural and Horticultural Society of Calcutta, Vol. iv. p. 180.

that in its neighbourhood, a large tract of country, well adapted to tea cultivation, was lying waste. Such, however, no doubt, was the case prior to the last settlement: now all the irrigable land is covered with rich cultivation. I must now, therefore, extend the plantations in the Chekhata district.

5. In Gurwahl, this remark of want of land close to the proposed manufactory does not apply; as in the immediate neighbourhood of the plantation of Guddowli there are hundreds of acres lying waste, and covered with dense tree and shrub vegetation, giving cover to bears, leopards, deer, and tigers. Were, however, these extensive jungles cleared, these animals would of course disappear. Here at present there are only three mallees, and therefore much additional assistance is required. By the assistance of prisoners, for whom I was indebted to Captain H. Ramsay, and a few coolies, four to five acres of land have been already cleared, in order to transplant some thousands of young seedling plants which were ready for the purpose.

6. In the Deyrah Dhoon, too, any quantity of land can be obtained, and there are many thousands of young plants available in the Rumaserai and Kouth and other plantations for transplanting.

7. Rumaserai nursery might, with advantage, be reduced, as the object for which that plantation was established has been gained; that is, it has been proved that the tea plants thrive well in that locality; all the smaller plants might, therefore, be removed to Deyrah, and the large ones being valuable, as they are the original plants procured by Dr. Gordon in China, or raised from seeds sent by him to Dr. Wallich in the Calcutta Garden,* might be made over to the zemindars of Rumaserai, and a sum equal to one-half of the present expense for keeping up the plantation, given to them,

* See Tea papers in Blue Book of House of Commons, for 1839, p. 100.

in order to induce them to take care of the plants, and transmit the seeds when ripe. The present monthly expenditure is Rupees 12, or Rupees 144 per annum, viz. Rs. $12 \times 12 = 144$. Rumaserai is about 70 miles distant from Mussoorie, in the Tehree Rajah's country, and though the valley is extensive and a great portion of it uncultivated, the plantation could not, probably, be increased without a reference to the Rajah. Nor would the tea leaves be available unless Government were prepared to establish (which would not be advisable at present) a manufactory somewhere in the Rajah's country, as Deyrah is too far distant for them to be transported, over a rugged and mountainous country without detriment.

8. Nor is there any advantage to be gained by keeping up the Kouth plantation, also in the Tehree Rajah's country, further than as a seed depôt. It too therefore, might, with advantage be placed on the same footing as that of Rumaserai. The annual expenditure is the same.

II.—*Number of young Plants ready for transplanting.*

9. In addition to the last year's young plants in the following table—

Table showing the number of Seedling Plants, &c. of 1846 ready to Transplant.

Name of Plantation.						No. of seedlings of 1846.	Layers.	Cuttings.
KUMAON.								
Bhurtpoor,	..	..	..	..	..	6,232	775	..
Lutchmiser,	..	..	..	..	..	9,544	..	..
Kuppeena,	..	..	..	..	..	16,014	..	..
Russiah,	..	..	..	..	..	59,712	..	5,224
Kooasur,	..	..	..	..	..	91,000	..	..
Annoo,	..	..	..	..	..	24,000	..	..
Huwalbaugh,	..	..	..	..	..	36,340	..	..
Chullar,	..	..	..	..	..	..	..	..
Total,						242,842	775	5,224

Name of Plantation.	Nb. of seedlings of 1846.	Layers.	Cuttings.
GURWAHL.			
Guddowli,	5,000	..	..
Kaolagir,	4,000	..	..
Konth,	500	..	..
Rumaserai,	500	..	..
Total,	10,000	..	..
Grand Total,	252,842	775	5,224

about a crore of seeds, the produce of the plantations, have been sown, and as two-thirds generally germinate, there ought to be upwards of 600,000 seedlings this season, which will be ready to transplant by the end of the rains, or from September to March.

10. To the kindness of Mr. Lushington and Captain H. Ramsay, I am indebted for a large quantity of seeds, the produce of tea plants in their gardens.

III.—Quantity of Tea manufactured, and future prospects.

11. The quantity of tea manufactured as per appended tables—

Table showing the quantity of Tea manufactured in 1845.

Name of Plantation.	Number of acres.	Quantity of black Pouchong Tea.	Quantity of Bohea Tea.	Total.	Quantity* of Green Tea.	Grand Total.
		lb oz.	lb oz.	lb oz.	lb oz.	lb oz.
Huwalbaugh, ..	30	24 ..	4 12	28 12	.. ..	.. ..
Lutchmiser, ..	3	166 12	50 ..	216 12	.. ..	.. ..
Kuppeena, ..	4	120 ..	16 4	136 4	.. ..	.. ..
Bhurtpoor, ..	3	63 ..	14 6	77 6	.. ..	.. ..
Russiah, ..	49	124 ..	27 ..	151 ..	.. ..	.. ..
Grand Total, ..	89	497 12	112 6	610 2	.. ..	.. ..

* The Green Tea implements did not arrive in time to enable the manufacturers to make Green Tea this season.

Table showing the quantity of Tea manufactured in 1846.

Name of Plantation.	Number of acres.	Quantity of black Pou- chong Tea.	Quantity of Bohea Tea.	Total.	Quantity of green Tea.	Grand Total.
		lb oz.	lb oz.	lb oz.	lb oz.	lb oz.
Huwalbaugh, ..	30	43 10	9 6	53 ..	10 ..	63 ..
Lutchmisser, ..	3	156 14	36 1	192 15	80 ..	272 15
Kuppeena, ..	4	126 14	37 8	164 6	52 ..	216 6
Bhurtpoor, ..	..	64 14	19 4	84 2	40 ..	124 2
Russiah, ..	49	211 8	61 12	273 4	63 ..	336 4
Kooasur, ..	29	9 12	1 4	11 ..	.. ..	11 ..
Grand Total, ..	115	613 8	165 3	778 11	245 ..	1023 11

amounted in 1845 to 610 lb 2oz., and in 1846, or last season, to 1,023 lb 11oz. From these tables we find, that the small nursery of Lutchmisser, consisting of three acres of land, gave a return in 1845 of 216 lb, or 2 maunds and 56 pounds; in 1846 the return was 272 lb, or 3 maunds and 32 pounds.

12. The small plantation of Kuppeena, established in 1841-42, and then consisting of three acres (but increased in 1844 to four), yielded in 1845 1 maund and 56 pounds, and in 1846 2 maunds and 56 pounds. Thus we have received from a plantation of only five years' formation, and of four acres, one of these recently added, upwards of two and a half maunds of tea, and from another, Lutchmisser, of three acres, which was established in 1835-36, 3 maunds and 30 pounds, equal to 272 lb. I have in a former report asserted, that the minimum return of tea for an acre of land may be estimated at one pukka maund, or 80 lb. The only plantations that I can as yet bring forward in favor of my assertion, are the two above-mentioned: Kuppeena has not yielded the proportion mentioned, but as stated,* it was only established in 1841-42, and the tea plants do not come into full bearing

* See Report Loc. Cit. p. 180.

until the 8th year : on the other hand, Ldtchmisser has given more than the average return. I think, therefore, that the returns already yielded are highly favorable, and that though the data are small, they are highly satisfactory.

IV.—*Sale of Tea at Almorah, in July 1846.*

13. At this sale nothing but black (Pouchong) tea was put up, the Bohea tea having been reserved for the natives of Bhote. The maximum price per seer realized was Rupees 7-7 ; minimum Rupees 4-8, and average Rupees 6-8-8.

14. The large price given, shows the estimation in which it is held in the province, and from the table* appended it will be perceived, that of the 38 boxes sold by public auction, 29 realized upwards of Rupees 7 per seer, and that by the native community 20 boxes were purchased.†

15. *Bohea tea.*—Several boxes of this coarse tea have been sold to the Bhotcahs, at a price varying from Rs. 2 to Rs. 2-4 per seer. It has been purchased by them in order to carry it across the passes into Thibet ; details will afterwards be furnished. I may state, that it has been sold at a low rate in order to induce a demand,‡ and to exclude from the British provinces the miserable article which is imported by the Bhoteahs under the name of tea from Chinese Tartary. Nor will it be long, if the importation of Kumaon tea into Chinese Tartary is not prohibited, before that market is wholly supplied from the British provinces.

* See appendix A.

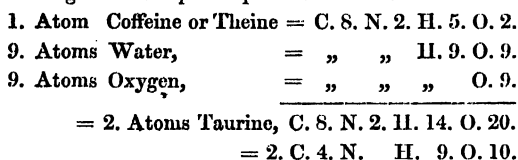
† In addition to these 38 boxes, 12 boxes containing 453 lb of tea have been dispatched to the Hon'ble the Court of Directors.

‡ It has been a matter of surprise why tea should be so much sought after by the poorer classes, as by many it is looked on more as a luxury than as of use to the human system. The manner in which it acts, and the cause why it is in so much demand by all classes, is satisfactorily explained by Liebig, and the benefit therefore which will be conferred by selling it at a low rate, and thus placing it within the means of all, will, no doubt, ere long, be duly appreciated. Liebig says, without entering minutely into the

V.—Soil best adapted for the Tea Plant.

16. The soil in which the tea plant is now thriving in the Himalayas and in the valley of Deyrah Dhoon, varies exceedingly. At Bhurtpoor and Russiah it is of a light silico-aluminous nature, and abounding with small pieces of clay slate, which is the subjacent rock, and trap (greenstone) which occurs in large dykes cutting through and altering the strata of clay slate, mixed with the stony soil, there is a small quantity of vegetable matter. The clay slate is metamorphic, being almost entirely composed of mica. In some places it is mixed with quartz forming mica slate. From the decomposition of these rocks, mixed with a small quantity of vegetable matter, the soil is formed. At Kup-

medical action of Coffeine (Theine) it will surely appear a most striking fact, even if we were to deny its influence on the process of secretion, that this substance, with the addition of oxygen and the elements of water, can yield Taurine, the nitrogenized compound peculiar to bile :



To see how the action of Coffeine, Asparagine, Theobromine, &c., may be explained, we must call to mind, that the chief constituent of the bile contains only 3·8 per cent. of nitrogen, of which only the half or 1·9 per cent. belongs to the Taurine. Bile contains, in its natural state, water and solid matter, in the proportion of 90 parts by weight of the former to 10 of the latter. If we suppose these 10 parts by weight of solid matter to be chloric acid, with 3·87 per cent. of nitrogen, then 100 parts of 0·171 of nitrogen in the shape of Taurine. Now this quantity is contained in 0·6 parts of Coffeine, or $2\frac{8}{10}$ th grains of Coffeine can give to an ounce of bile the nitrogen it contains in the form of Taurine. If an infusion of tea contain no more than the $\frac{1}{10}$ th of a grain of Coffeine, still, if it contribute in point of fact to the formation of bile, the action, even of such a quantity, cannot be looked upon as a nullity. Neither can it be denied, that in the case of an excess of non-azotized food, and a deficiency of motion, which is required to cause the change of matter of the tissues, and thus to yield the nitrogenized product which enters

peena and Lutchmisser, the soil is also very stony, formed from the decomposition of clay slate, which, in many places, as at Russiah and Bhurtpoor, passes into mica slate, or alternates with it, and a little vegetable matter. The same remark applies to the plantations of Guddowli, Kouth, and Rumaserai. At Huwalbaugh part of the soil consists of a stiff clay, of a reddish-yellow color, owing to peroxide of iron. Here, too, the tea plants, provided that the ground around them is occasionally opened up, thrive well. In Mr. Lushington's garden at Lobha, in Kumaon, and in Assistant Commissioner Capt. H. Ramsay's garden at Pooree, in Gurwahl, plants are thriving well in a rich, black, vegetable mould. The soil in the Deyrah Dhoon varies exceedingly from clayey and stiff soil to sand and gravelly soil, or light and free. The soil at Kaolagir is a compound of the two, neither clayey, nor free, or light soil, being composed partly of clay and sand, mixed with much vegetable mould, and in some places mixed with much gravel, consisting of limestone, marl, sandstone, clay slate, and quartz rock, or of such rocks as enter into the composition of the surrounding ranges of mountains, viz. the Sewalick range to the south, and the Himalayas, properly so called, to the north. From the above state-

into the composition of the bile ; that in such a condition the health may be benefited by the use of compounds which are capable of supplying the place of the nitrogenized substances produced in the healthy state of the body, and essential to the production of an important element of respiration. In a chronic sense, and it is this alone which the preceding remarks are intended to show, Coffeine or Theine, Asparagine, and Theobromine are in virtue of their composition, better adapted to this purpose than all nitrogenized vegetable principles. The action of these substances in ordinary circumstances is not obvious, but it unquestionably exists. Tea and coffee were originally met with among nations whose diet is chiefly vegetable. These facts, remarks Dr. Royle, show in what way tea proves to the poor a substitute for animal food, and why females and literary persons, who take little exercise, manifest such partiality for it. They also explain, why the attempts, and they have been numerous, to find among other plants a substitute for tea, have invariably failed of success."

ment we find, that the tea plant thrives well both in stiff and free soils, and in many modifications of these. But the soil which seems best adapted to its growth may be styled free soil, as at Russiah, or a mixture of both, as at Kaolagir, in the Deyrah Dhoon.

17. In limestone districts, where the tea has been tried, if the superimposed soil has been thin and untransported, and this proved from the decomposition of the subjacent rock, the plant has generally failed, and this has been particularly the case when the limestone, by plutonic action, has become metamorphic. These districts therefore, in forming plantations, are to be avoided.

18. From the writing of various authors* it appears, that the districts where the tea plant thrives best in China, have a geological structure very similar to that met with in many parts of the Himalayas, being composed of primitive and transition rocks.

VI.—*Altitude above the sea best suited to the Tea Plant.*

19. To state what altitude is best adapted to the growth of the tea plant, and for the production of the best kinds of tea, will require much more observation. At present the tea plant thrives equally well at Kaolagir, in the Deyrah Dhoon; at Russiah, in the Chikata district; at Huwalbaugh; at Kuppeena and Lutchmisser; and at Rumaserai, or at heights ranging from 2,200 feet above the level of the sea to 6,000 feet.

20. Moreover, the tea manufactured from leaves procured from Kaolagir, has been considered by the London brokers equal to that made from leaves procured from Lutchmisser and Kuppeena.†

* See Royle's *Illustrations of Indian Botany*, p. 112.

† For the report of the London brokers on the tea manufactured at Huwalbaugh, see my report in the *Journal of the Agricultural and Horticultural Society of Calcutta*, Vol. ii. p. 331.

VII.—On the method of preparing ground prior to forming a Plantation, viz. : fencing, draining, ploughing, trenching, &c.

21. In forming a plantation, the first object of attention, both in the hills and in the Deyrah Dhoon, is a fence. In the former, to prevent the depredations of wild animals, such as wild hog, deer, &c. which abound in the hills, and though they do not eat tea leaves, yet hogs, in search of tubers, in the space of a single night will do much damage by uprooting young shrubs. In the latter, to prevent the straying of cattle. The first thing to be done, therefore, is to dig a trench three feet broad and two deep, and to plant a hedge, if in the hills, of black thorn (*Cratægus*) : if in the plains, the different species of *aloe* are best adapted for the purpose. The fence being formed, all trees and shrubs are then to be uprooted : this is very heavy work, both in the hills and

I append here the report of the London brokers on the tea manufactured at Deyrah from leaves procured from the Kaolagir plantation, which was published in the Government Gazette.

“Report on the tea manufactured in the Deyrah Dhoon, received per *Minerva* June, 1846.

“*Appearance of the Tea*.—Well made, as well as China tea, and similar to the blackish, mixed curled Tetsong description.

“*Smell*.—As China Tea, but deficient in fragrance, arising probably from some defect in the firing.

“*Color of the infusion*.—Bright and good.

“*Taste*.—Rich, good, and strong.

“*Expanded Leaf*.—As the finer tea from China.

“*Aroma*.—As good China tea.

“From this, and examinations of former samples, I am quite satisfied that the tea shrub in Kumaon is not only identical with the China plant, and as capable of being made into as fine a description of tea, but also that the climate and soil in Kumaon is as suited to the favorable growth of the shrubs as the finest of the China localities.

“8th June, 1846.

(Signed) WM. ANDREWS HUNT.”

“The leaf is well made, curled, of the Ankoï Pekoe class, mixed black and brown, and closely resembles that class of China tea.”

plains, from the vast number of shrubs, allowed by natives, from indolence to remove them, to grow everywhere throughout their fields. Roads are then to be marked off.

22. After this has been accomplished, the land is to be drained, if necessary, by open drains—under-drainage, for want of means and the expense, being impracticable—and then ploughed three or four times over. The beds for young tea plants are then to be formed; these ought to be three feet in breadth, alternating with a pathway of two feet in breadth. By arranging beds in this manner, much time and labor is saved in transplanting: in irrigation the water is economized, and in plucking tea leaves a road is given to the gatherer. In transplanting, each plant is allowed $4\frac{1}{2}$ feet; this is at once gained, the beds and pathways being formed by placing in one direction, the plant in the centre of the bed.

23. *Trenching*.—On the beds being marked off, they are to be trenched to a depth of from 2 to 3 feet, in order to destroy all the roots of weeds, which are to be carefully removed.

"The flavor is very strong, and would therefore be serviceable for mixing, but is "coarse burnt," that all richness of flavor is destroyed."

"38, MINCING LANE : "(Signed) WM. THOMSON and SON."
6th June, 1845."

"The sample of tea marked as manufactured in the Deyrah Dhoon, August 1845, in leaf somewhat resembles the tea imported from China as Ning-Young, with something of the character both of Oolong and Orange Pekoe. In flavor it most resembles the better descriptions of Orange Pekoe, having, with brisk burnt flavor of that description, more than its usual strength.

"There is, however, in this sample a slight peculiarity of smell and flavor, which is rather objectionable, but it probably arises from some accidental cause to which this sample may have been exposed, either in curing or subsequently."

"We consider it a good useful description of tea."

"(Signed) EWART, MACCAGHEY & DELAFOSSE, *Brokers*."
"CAPTIAL COURT : 17th June, 1846."

The trenching is to be performed by the *fowrah* or Indian spade.

24. In the hills, in many places the *fowrah* cannot be used owing to the number of stones. The work is then to be done by the *koallah*, a flat-pointed piece of iron, of about 8 inches in length, which is inserted into a wooden handle. It is in form like the pick, and is much used in hill cultivation for weeding and opening up the ground. It is, however, not much to be commended for trenching purposes, as natives, in using it, never penetrate the ground beyond a few inches. For weeding however, it is particularly useful, and to such soil is much better adapted than most other implements.

25. *Formation of Roads and Paths.*—In addition to the pathways of 2 feet in breadth recommended to be formed between each bed, there ought, for general use, to be a 4 feet road carried round the plantation, and one of 10 feet through the centre. This applies to a limited plantation, that is, of from 2 to 4 hundred acres: If on the other hand it was on a more extensive scale, several hackery roads of 10 feet in breadth would be necessary, in order to cart away weeds, &c. or carry manure to seedling beds.

VIII.—On seeds when ripe, and season and method to be adopted to ascertain it.

26. In all September and October the tea seeds ripen, and in the more elevated plantations, as at Rumaserai, many do not ripen until November. The seeds are contained in a capsule, and vary in number from 1 to 7; to ascertain that they are ripe, open the capsule although green, and if their color is a nut-brown, as represented at *a*, in Fig. No 2, they are sure to be so. If they are not ripe, they are of a reddish-brown above, mixed with white. If the seeds are allowed to remain a short time on the bushes, after they are ripe, the capsules burst, and they fall out: it is necessary, therefore, to remove them before this takes place.

IX.—*On the method of sowing seeds, and season, and on the treatment of the young Tea Plants after they have germinated:*

27. The ground having been first well trenched and manured, that is, from sixty to seventy maunds of manure given to the acre, the seeds are, when ripe, to be removed from the capsules, and immediately sown to the depth of one inch and very close, in drills, 8 to 10 inches apart from each other. The sooner that they are sown after being removed from the capsules the better, as their germinating properties are apt to be destroyed if they are kept for any length of time. Some germinate in the space of a few weeks, others lie dormant until February and March, and others do not germinate until the rains.

28. The method of sowing seeds in China is thus described, being similar to the native plan of sowing mangoes in this country. "Several seeds are dropped into holes four or five inches deep and three or four feet apart, shortly after they ripen, or in November and December; the plants rise up in a cluster when the rains come on. They are seldom transplanted, but sometimes four to six are put quite close to form a fine bush."* By this method nothing is gained, and the expenditure of seeds great.

29. If the plants germinate in November, which, as already stated, many do, they ought to be covered with a *chupper* made of bamboo and grass.

30. In the hills, everywhere at an elevation of 6 and 7000 feet, the Ringal, a small kind of bamboo, of which there are several species, is found in great abundance, and well adapted for the purpose, and in the Deyrah Dhoon the bamboo occurs in vast quantity; the market of the upper provinces being

* See article *Thea* by Dr. Royle, in *Penny Cyclopædia*, Vol. xxiv, p. 286—also *Tropical Agriculturist*, by Porter, p. 129.

chiefly supplied from that valley and other forests at the base of the Himalayas. Bamboos are also met with to the height of six and seven thousand feet on the Himalayas in the neighbourhood of Almorah ; nearly the whole of the bamboos however have been destroyed this season by the severe snow storm of the 3rd February. During the day, in the cold weather, the *chuppers* ought to be removed, and again replaced at night : again, as the weather becomes hot, it is necessary to protect the young plants from the heat of the sun, that is, in April and May, and until the rains commence : the *chuppers* at this time ought to be put on about 8 A. M. and removed again about 4 P. M.

X.—*Method of rearing Plantations by sowing seeds, by layers, and by cuttings.*

31. In the former chapter we have already discussed the method of raising plants by seeds. We shall now notice the other two modes.

32. *Layers*.—The best season for laying down is when the sap is dormant, or in the cold weather, or when in full action as in the rains. “Laying,” as expressed by Dr. Lindley, “is nothing but striking from cuttings, which are still allowed to maintain their connection with the mother plant by means of a portion of their stem.”* There are various methods of making layers, but the most simple and efficient is to bend down a branch, and sink it into the earth after having made a slit or notch in the centre of the embedded portion. By so doing the descent of the sap is retarded, and thus the formation of radicles or young roots is promoted ; about five or six inches, or more of the branch is to be allowed to remain above ground, and in a position as perpendicular to the point where the plant is notched, as possible. In three or four months these layers are ready to be removed and transplanted ; the removal of the layers is to be gradual.

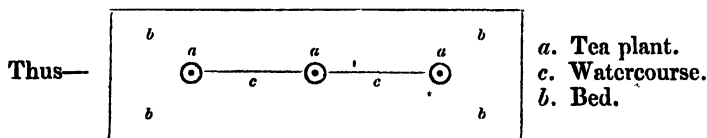
* Neill's Fruit, Flower, and Kitchen Garden, p. 31.

that is, they ought first to be cut half through, then a little more, and finally altogether separated.

33. *Cuttings*.—The best season for propagating by cuttings is the cold weather, that is, from November to February, they may also be propagated, though not with the same success, during the rains: it is necessary to protect them against frost in the cold weather, and from the rays of the sun in the hot. Cuttings put in during the cold weather, are ready to transplant in the rains, and if put in during the rains, they are generally fit for removal in February.

XI.—*On the method of Transplanting and season.*

34. On transplanting young tea plants care is to be taken to lift them with a good large ball of earth attached to their roots, as they throw out a long central or tap root, which, if cut through, invariably destroys the plant. On being placed in the ground, the earth around them is to be well pressed down and watered; the watering is to be continued every third or fourth day, until the plants have taken hold of the ground. During the rains, grass springs up with great rapidity, so as to render it impossible for one man to keep three acres (the quantity assigned by us) clean. This however is not necessary, if care be taken to make a golah round each plant, and keep it clear of weeds; these golahs ought always, in hill plantations, where the ground is irregular, to be connected by small *khauls* or channels, in order to make irrigation easy, by so doing too, water, if the supply be scanty, which often happens in the hills in the hot weather, will be economized.



35. We have already stated that $4\frac{1}{2}$ square feet ought to be assigned to each plant. In China, according to Royle,*

* *Loco citato.*

three to four feet are given, this however is too small a space to allow the plant to grow freely. After the tea plants are transplanted, it is not necessary to protect them.

36. The best seasons for transplanting are towards the end of February, or as soon as the frost has ceased, and throughout March, and during the rains, and until the end or middle of November, depending on the season.

37. In transplanting, four parties ought to be employed, viz. one party to dig holes, a second to remove plants, a third to carry them to the ground where they are required, and a fourth to plant. By doing so, not only time is saved, but also the plants have a much better chance, when thus treated, of doing well. When the seedling beds are extensive, so many of the plants ought not to be removed, that is, a plant left every $4\frac{1}{2}$ feet, and these beds added to the plantation.

XII.—*On Pruning, best season and mode.*

38. The plants do not require to be pruned until the fifth year, as the plucking of leaves generally tends to make the plants assume the basket shape, the form most to be desired to procure the greatest quantity of leaves; if, however, the plants show a tendency to run into weed, from central branches being thrown out, this ought to be checked by removing the central stem. In the fourth year a quantity of the old and hard wood ought to be removed, to induce the plant to throw out more branches. The best season for pruning is from November to March.

XIII.—*On Irrigation.*

39. To keep the tea plants healthy, irrigation for two or three years is absolutely necessary, and no unirrigable land ought to be selected for a tea plantation.

40. On the other hand, land liable to be flooded during the rains, and upon which water lies for any length of time. is

equally detrimental to the growth of the plant. This applies to a small portion of the Kooasur plantation, which receives the drainage of the adjoining hills, and the soil being retentive, keeps the water. Deep trenches have been dug in order to drain it off—these, however, owing to the lowness of the surrounding country, act badly. Three successive seasons' plants have been put into the ground, and as often have been destroyed on the setting in of the rains, showing the necessity of avoiding such kind of land for tea plantation.

41. To facilitate irrigation, &c., as already stated, in the Deyrah Dhoon, I have limited the tea beds to three feet in breadth. This is particularly requisite in land so constituted as that of the Deyrah Dhoon, it being so porous, as mentioned by Major Cautley in his notes and memoranda of watercourses: * this is caused by the superincumbent soil not being more than from one to three feet thick, in some places more, but varying exceedingly. Beneath this there is a bed of shingle of vast thickness, through which the water percolates; it is this that renders the sinking of wells so difficult in the Deyrah Dhoon, and which has tended so much to retard individuals from becoming permanent residents. At present there are many tracts of several thousand acres in that valley unoccupied from want of drinking water, as for instance at Innesphacel.

42. Where the ground is very uneven, as is the case generally in the hills, the *Khaul* system, as already recommended, ought to be adopted.

XIV.—*On the Tea Plant; season of flowering; its characters and species; and on the advantages to be derived from importing seeds from China.*

43. From the importance of tea, as an article of commerce, the plant has attracted much attention, and from few quali-

fied Europeans having travelled in the tea districts of China, there is much difference of opinion as to the number of species belonging to the genus *Thea*.

44. In the Government plantations in Kumaon and Gurwahl, the plants begin to flower about the end of August and beginning of September, or, as the seeds of the former year begin to ripen. They do not all come into flower at once, but some are in full blossom in September, others in October, November, December, or January. Some throw out a second set of blossoms in March, April and May, and during the rains ; so that from the same plant unripe or ripe seeds and flowers may be collected at once and the same time.

45. To the genus *Thea*, which belongs to the order *Ternstroemiaceæ*, the following characters have been ascribed : calyx persistent, without bracts, 5-leaved, leaflets imbricated, and generally of the same size. Petals of the corolla vary in number from 5 to 9, imbricated, the inner ones much the largest. Stamens numerous, in several rows adhering to the bottom of the petals. Filaments filiform. Anthers incumbent, 2-celled, oblong, with a thickish connectivum. Cells opening longitudinally. Ovary free, 3-celled : ovules 4 in each cell, inserted internally into the central angle, the upper ones ascending, the lower pendulous. Style trifid, stigmas three, acute. Capsule obovoidal, 1-7 lobed, with loculicidal dehiscence, or with dessepiments formed from the turned in edges of the valves. Seeds solitary, or two in cells, shell like testa, marked with the ventral umbilicus. Cotyledons thick, fleshy, oily, no albumen. Radicle very short, very near the umbilicus, centripetal.* In the plantations there are two species, and two well marked varieties.

46. The first is characterized by the leaves being of a pale-green color, thin, almost membranous, broad lanceolate, sinatures or edge irregular and reversed, length from three

* See Royle, *Loco cit.*, p. 284.

to six inches. The color of the stem of newly formed shoots is of a pale-reddish color, and green towards the end. This species is also marked by its strong growth, its erect stem, and the shoots being generally upright and stiff. The flowers are small, and its seeds but sparing.

In its characters, this plant received from Assam, agrees in part with those assigned by Dr. Lettsom and Sir W. Hooker to the *Thea viridis*,* but differs in its branches being stiff and erect. The flowers small, or rather much about the same size as the species about to be described, and not confined to the upper axils of the plant, and solitary, as stated by them.† In Fig. No. 1. a correct drawing of the plant is given, as it grows in the Kaolagir plantation, in the Deyrah Dhoon. By the Chinese manufacturers it is considered an inferior plant for making tea, it is not therefore grown to any extent.

47. The second species is characterized by its leaves being much smaller, and not so broadly lanceolate; slightly waved, of a dark-green color, thick and coriaceous, sinature or edge irregular, length from 1 to 3½ inches. In its growth it is much smaller than the former, and throws out numerous spreading branches, and seldom presents its marked leading stem. This species, therefore, in the above characters, agrees much with those that have been assigned to *Thea Bohea* by authors. The characters have been mixed up in an extraordinary manner. Thus it has been stated, that the *Thea viridis* has large, strong growing and spreading branches, and that *Thea Bohea* is a smaller plant, with branches stiff and straight, and stem erect. No doubt the *Thea viridis* is a much larger and stronger growing plant than the *Thea Bohea*, or rather the plant now existing in the different plantations is so; but in the former the branches are stiff and erect, and in the latter inclined and branching. The marked distinguishing cha-

See Royle, *Loco cit.*, p. 285.

† Hooker's Bot. Mag. 1. 3148. It is the Assam tea plant.

acters between the two species are the coriaceous dark-green leaves in the *Thea Bohea*, and the large pale-green monhaneous leaves of *Thea viridis*. The manner too of growth is very striking, and on entering the plantation, the distinction is at once most marked to the most unobservant eye. In Fig. 2, a good representation of *Thea Bohea* is given. This species forms nearly the whole of the plantations, and was brought from China by Dr. Gordon.

48. In the plantations there is a third plant, which however, can only be considered a marked variety of *Thea Bohea*. Its leaves are thick, coriaceous, and of a dark-green color, but invariably very small, and not exceeding two inches in length, and thinly lanceolate; the serratures too on the edge, which are straight, are not so deep. In other characters it is identical. This marked variety was received from Calcutta at the plantation in a separate despatch from the others; it is figured in No. 3.

49. But in addition to these there are, no doubt, many more varieties, and though it may be a fact, that in certain districts green tea is manufactured from a species differing from that from which black tea is manufactured; yet in other districts green and black teas are manufactured from one and the same plant. The Chinese manufacturers now in Kumaon state, that the plant is one and the same,* and that it can be proved by converting black tea into green. In manufacturing teas now at the manufactory, if a large quantity of leaves are brought in from the plantations, one-half are converted into green, and one-half into black tea. This only shows that much of the green and black teas of commerce are manufactured from one and the same plant. The Assam plant is, from the characters given, quite a distinct plant, and

* In a letter lately received from Dr. Royle it is stated, that Mr. Fortune, who lately visited China, maintains that there are two species of *Thea*, viz. *Thea viridis* and *Thea Bohea*, and that from both, green and black teas are manufactured. The *Thea viridis* is the most commonly distributed plant.

agrees as already stated, most nearly with the species described as *Thea viridis*. It would therefore be most desirable to procure seeds of this so-called species, and also of other varieties, of which, no doubt, there is a great variety. From the northern districts of China in particular, seeds ought to be imported, not however, in large quantities, but in quantities of two or three seers, so that they might, on arrival at Calcutta, be sent up the country as quickly as possible, for if the seeds are kept long out of the ground, not one will germinate; such was the fate of all the seeds contained in 10 boxes imported by Government in 1845, not one having germinated, which was much to be regretted. Had they been sent in small parcels, well packed in wax-cloth to prevent them from being injured by moisture, and placed in an airy part of the vessel in transmission from China to Calcutta, and on arrival there, sent by dâwk banghy direct to the plantation, they would, I am confident, have reached in good condition. It is well worthy of a trial; and seeds ought, if possible, to be obtained from every district celebrated for its teas. It is in this manner, by obtaining seeds of the finest varieties of plants, that the finest teas will be procured. I do not mean to infer that the tea plants now under cultivation are not the produce of fine varieties, for that has been proved by the undoubted testimony of the London brokers, but only, that there are no doubt, many others well worthy of introduction. In confirmation of what I have stated, I may quote the words of my late friend Dr. Griffith, who, in his report on the tea plant of Assam, says—"I now come to the consideration of the steps, which in my opinion must be followed if any degree of success in the cultivation of tea is to be expected; of these the most important is the importation of Chinese seeds of unexceptionable quality, and of small numbers of finer sorts."* Dr. Royle too, who was the first person to point out

* Report on Tea Cultivation submitted to House of Commons. See Blue Book 1839, p. 103.

that the Himalayas were well adapted to tea cultivation, and to whom the credit for recommending to Government the introduction of the plant into Northern India is due, strongly urges the necessity of importing seeds from different localities in China, celebrated for their teas.

XV.—Method and season for plucking and gathering leaves.

50. The season for picking leaves commences in April and continues until October. The number of gatherings varies, depending on the moisture* or dryness of the season. If the season be good, as many as seven gatherings may be obtained. If, however, the rains are partial, only four or five. These however may be reduced to their general periods for gathering, that from April to June, from July to 15th August, and from September to the end of October. But few leaves are collected after the 15th of the latter month. As soon as the new and young leaves have appeared in April, the first plucking takes place, this being done by the Chinese, assisted by the mallees. The following is the method adopted:—A certain division of the plantation is marked off, and to each man a small basket (fig. 18) is given, with instructions to proceed to a certain point, so that no plant may be passed over. On the small basket being filled, the leaves are emptied into another large one, which is put in some shady place, and in which, when filled, they are conveyed to the manufactory. The leaves are generally plucked with the thumb and forefinger. Sometimes the terminal part of a branch, having four or five young leaves attached, is plucked off. All old leaves are rejected, as they will not curl, and therefore are of no use.

51. As the season advances, and manufactory and plantation works become necessary, the mallees are assisted in gathering.

* In a short time, rain guages will be established at Bheemtal, Huwalbaugh, Paoree, and Kaolagir, in order to measure the quantity of rain that falls annually, for the purpose of ascertaining how much the quantity and quality of the produce of tea is affected by the weather. The tables will be furnished with our reports.

leaves by coolies. The process is simple, and thus every man, woman, and child of villages could be profitably employed, on the plantations being greatly extended. Certain kinds of leaves are not selected in the plantation, in order to make certain kinds of tea, but all new and fresh leaves are indiscriminately collected together, and the different kinds separated on the leaves being fired.

XVI.—*On the method of Manufacturing Black Tea.*

52. The young and fresh leaves on being picked (they only being used, the old ones being too hard, and therefore unfit to curl); are carried to the manufactory, and spread out in a large airy room to cool, and are there kept during the night, being occasionally turned with the hand if brought in in the afternoon; or if brought in during the morning, they are allowed to lie until noon. Early in the morning the manufacturers visit the airing room, and pack up the leaves in baskets, and remove them to the manufacturing room. Each manufacturer takes a basketful, and commences to beat them between the palms of his hands with a lateral motion, in order to soften and make them more pliable for working, and thus prevent them, when rolled, from breaking. This beating process continues for about an hour, and it may either consist of one or two processes, that is, the Chinese sometimes finish the beating process at once; at others, they allow the leaves, after being beat for half an hour, to remain a time and then resume it. They now go to breakfast, and in one hour and a half the leaves are ready for the pan (fig. 3). The pans being heated by wood placed in the oven, (fig. 3 *a.*) so as to feel hot to the hands, are filled to about two-thirds, or about three seers of leaves are thrown in at a time—the quantity which a manufacturer is capable of lifting with both hands. With the hands, the leaves are kept moving with a rotatory motion in the pan, and when they become very hot, the motion is kept up with a pair of forked sticks (fig. 11). This pro-

cess is continued for three or four minutes, depending on the heat of the pan, or until the leaves feel hot and soft. They are then with one sweep of a bamboo brush, (fig. 5,) swept into a basket (fig. 6,) and thrown on to the rolling table, which is covered with a coarse mat made of bamboo (fig. 7). Each manufacturer then takes as much as he can hold in both hands, and forms a ball, and commences to roll it with all his might with a semicircular motion, which causes a greenish-yellow juice to exude. This process is continued for three or four minutes, the balls being occasionally undone and made up again. The balls are then handed to another party at the extremity of the table, to undo them and spread the leaves out thinly on flat baskets, and expose them to the sun, if there is any, if not they are kept in the manufactory. After all the leaves have gone through this process the first baskets are brought back, and the leaves again transferred to the pan, worked up in a similar manner for the same length of time, retransferred to the table, and again rolled. This being done, the leaves are again spread out on large flat baskets to cool. On being cooled the leaves are collected together and thinly spread out on flat wicker-worked sieve baskets (fig. 9), which are placed in others of a deep and of a double-coned shape. The *choolahs* (fig. 12) being lighted for sometime, and the charcoal burning clear, they are now ready to receive the coned baskets. The basket is placed over the *choolah* and kept there for about five minutes. The leaves are then removed, retransferred to the flat baskets, and re-rolled for a few minutes. This being done, the leaves are again brought together, placed in the conical baskets and kept over the charcoal fire for about two minutes. The contents of the conical baskets are then all collected together in a heap, and as much is placed in a conical basket as it will hold, and it is again placed over the charcoal *choolah* until the tea is perfectly dry. During this time the baskets are frequently removed and the tea turned, in order to allow

the leaves to be completely and uniformly dried, and the basket too is generally struck, on removal, a violent side blow with the hand, to remove from the sieve any small particles that might otherwise fall into the fire. Before removing the basket from the *choolah*, a flat basket is always placed on the floor to receive it, and all the particles which pass through, on the coned basket being struck, are again replaced. On the conical basket being filled, before placing it over the *choolah*, a funnel is made in the centre of the tea with the hand, to allow the heated air to pass through. Sometimes a funnel made of bamboo (fig. 13) is made for this purpose. After the tea feels perfectly dry, it is packed in boxes and sent to the godown.

53. Next day the different kinds of tea are picked, and on being separated they are again placed in the conical baskets and heated. During this process the baskets are frequently removed from the *choolah* in order to turn the tea, so that the heating may be general and uniform. In doing this, a flat basket is always placed on the floor, as on the former day, (and a flat basket too is placed on the top to confine the heat) to receive the conical one, which receives one or two blows to open the pores of the sieve. What passes through is replaced amongst the tea. When it is perfectly dry, it is ready for finally packing.

The kinds of black tea at present manufactured are—Souchong, Pouchong, Flowery Pekoe, and Bohea. The Flowery Pekoe is manufactured in September.

XVII.—*On the method of Manufacturing Green Tea.*

54. On the young and fresh leaves being plucked, they are spread out on the ground of the airing room and allowed to cool. After remaining for about two hours, or (if brought in late in the afternoon) during the night, they are removed to the green tea room (see No. 4, fig. *a.*) The pans being properly heated, the leaves as in the case with the black tea,

are thrown into the pans (fig 4 *a.*), and kept either with the hand or two forked sticks in constant motion for three or four minutes, and are then removed to the rolling table, and then rolled in the same manner in balls as the black tea. They are then scattered most sparingly on large flat baskets (fig. 8,) and exposed to the heat of the sun. If there is no sun, the baskets are arranged in frames, which are placed over the *choolah*, heated with charcoal. During the drying, the leaves are frequently made into balls and rolled in the flat baskets, in order to extract the juice. The drying process continues for about two hours, and on the leaves becoming dry, those contained in two baskets are thrown together, and then four basketsful into one, and so on until they are all collected together. In this state the leaves still feel soft, damp, and pliant to the hand, and are now brought back to the tea manufacturing room. Opposite to each of the inclined pans, (fig. 14 *a.*), which have been properly heated, so as to feel warm to the hand, by wood supplied to the ovens (*A*, fig. 14) underneath, one of the Chinese stations himself, and puts as many leaves into it as it will hold. He then moves them in a heap gently, from before backward, making these perform a circle, and presses them strongly to the sides of the pan. As the leaves become hot, he uses a flat piece of wood, in order that he may, more effectually, compress them. This process continues for about two hours, the leaves being compressed into at least, half of their bulk, and become so dry, that when pressed against the back part of the pan in mass, they again fall back in pieces. The tea, as by this time it has assumed this appearance, is now placed in a bag made of American drill or jean (the size depending on the quantity of tea), which is damped, and one end is then twisted with much force over a stick, and thus it is much reduced in size. After being thus powerfully compressed and beaten so as to reduce the mass as much as possible, the bag is exposed to the sun until it feels perfectly dry. If

there is no sun it is placed in the heated pan, and there retained until it is so. This finishes the first day's process.

55. On the second day it is placed in small quantities in the heated inclined pans, and moved up and down against the sides and bottom with the palm of the hand, which is made to perform a semicircle. This is continued for about six hours, and by so doing, the color of the tea is gradually brought out.

55½. Third day. It is passed through sieve baskets of different dimensions, then exposed to the winnowing machine, which separates the different kinds of green teas. The winnowing machine is divided into a series of divisions which receive the different kinds according to their size and weight.

1st. Coarsest, Souchoo. This tea, owing to its coarseness, is not marketable.

2nd. Chounchoo. This is a large, round-grained tea.

3rd. Machoo. This is also a round-grained tea, but finer than the former.

4th. Hyson.

5th. Gunpowder Hyson.

6th. Chumat. This kind of tea consists of broken particles of other kinds of tea.

56. On being separated, the different kinds of teas are placed in baskets, and picked by the hand, all the old or badly curled, and also light-colored leaves being removed, and others of different varieties, which by chance may have become mixed: To make the bad or light-colored leaves marketable, they undergo an artificial process of coloring,* but this I have prohibited in compliance with the orders of the Court of Directors, contained in your letter No. 190, dated 5th March 1845, and therefore do not consider this tea at present fit for the market. On the different teas being properly picked, they are again placed in the heated inclined

* In China this process, according to the statement of the tea manufacturers, is carried on to a great extent.

pan, and undergo separately the process of being moved violently up and down and along the bottom of the pan, for three hours, in the manner already described. The color is now fully developed. If the tea feels damp, it is kept longer than three hours in the pan. The tea is now ready to be packed.

XVIII.—*Packing Tea.*

57. As soon as the tea is prepared, boxes lined with sheet lead ought to be ready to receive it.

58. On being packed, it is to be firmly pressed down and the lead is then to be soldered. Before the sheet lead box is placed in the wooden one, it is covered with paper, which is pasted on to prevent any air acting on the tea, through any holes which might exist in the lead. The box is then nailed, removed to the godown, papered, stamped, and numbered. It is then ready for sale.

59. From what I have just stated it will be perceived, that box makers and sheet lead makers are essential to form a complete tea establishment. With reference to the box-making, it is unnecessary for me to make any remark, further than that care is to be taken in selecting wood for making boxes, as it ought to be free of all smell. All coniferous (pine) woods are therefore unfit for the purpose. In the hills the best woods are toon and walnut, and at Deyrah the saul (*Shorea robusta*).

XIX.—*Manufacture of Sheet Lead.*

60. Sheet lead making is a much more complicated process, and therefore requires some consideration. To make sheet lead the manufacturer mixes $1\frac{1}{2}$ to 3 seers of block tin with a pukka maund of lead, and melts them together in a cast metal pan. On being melted, the flat stone slabs, under which it is his intention to run the lead, are first covered with 10 or 12 sheets of smooth paper, (the hill paper being well

adapted to the purpose) which are pasted to the sides and chalked over. He then places the under stone in a skeleton frame of wood to keep it firm, and above it the other stone. On the upper stone the manufacturer sits and gently raises it with his left hand, assisted by 'throwing the weight of his body backwards. With his right hand he fills an iron ladel with the molten matter, throws it under the raised slab, which he immediately compresses and brings forward, (it having been placed back, and thus overlapping the under slab by about half an inch) with his own weight. On doing so the superabundant lead issues in front and at both sides, what remains attached to the slabs is removed by the iron ladel. The upper slab is now lifted, and the sheet of lead examined. If it is devoid of holes it is retained. If on the other hand, there are several, which is generally the case with the first two or three sheets run, or until the slabs get warm, it is again thrown back to the melting pan. After having run off a series of sheets, the slabs are to be examined, and if the paper is in the least burnt the first sheet is to be removed, and the one underneath taking its place, and thus securing an uniform smooth surface, is then to be chalked. According to the size of the stone slabs used, so is the size of the sheet lead. Those now in use are 16 inches square, by 2 inches in thickness, and are a composition, being principally formed of lime.

61. To make sheet lead boxes, a model one of wood, (a little smaller than the box for which the lead is intended) is formed, which has a hole in the bottom, and a transverse bar of wood to assist in lifting it up, instead of a lid. The lead is then shaped on this model and soldered. This being done, the model is removed by the transverse bar, and by pressing, if necessary, through the hole. The lead box is then papered over in case there should be any small holes in it to prevent the action of air on the tea, and when dry, transferred to the wooden box, for which it was intended.

XX.—Tea Manufactory.

62. The rooms of the tea manufactory ought to be large and airy, and to consist of 1st, a black tea manufactory, 2nd, a green tea manufactory; 3rd, winnowing room; and 4th, airing room. At Almorah the black tea manufacturing room is 53 feet long by 20 broad (see No. 4), and the other three, 20 by 24. The walls are 18 feet in height. The ground-plan shows how the ovens and *choolahs* are arranged. *A, A*, ovens for making black tea: *B*, ditto for green tea: *C, C, C*, ditto green tea: and *D*, *choolahs*.

XXI.—Implements required in Manufacturing Tea.

63. In the body of this report I have noticed all the different kinds of implements required. I may however again briefly notice them, and give a short account of each. (Figs. 1 and 2.)—Cast iron pans. In the manufactory there are two kinds in use, one received from China, the other from England. Both are considered equally good by the tea manufacturers, though in firing green tea they prefer the Chinese ones, as they are thinner, and are thus by them better able to regulate the heat. The Chinese pans (fig. 1,) are 2 feet 2 inches in diameter, and 10 inches in depth, by about $\frac{1}{8}$ of an inch in thickness.

64. The English pans (fig. 2,) are 2 feet 2 inches in diameter and 8 inches in depth, and rather thicker than the Chinese.

65. (Fig. 3.) The oven for making black tea (fig. 3 *a.*), of which a lateral view to show the door is given, is made of *kucha* brick. In height it is 2 feet 9 inches, in length 3 feet, and in breadth 3 feet 1 inch. Door (*a*) 1 foot 5 inches in height, and 11 inches in breadth. The base of the oven is 10 inches, elevated above the floor of the manufacturing room.

66. The oven with double pans for manufacturing green tea, (fig. 4,) is also built of *kucha* bricks. It is 3 feet in height

and 3 feet in breadth: base of oven 1 foot in height. Door 1 foot 6 inches in height, and 10 inches in breadth. The pans are placed horizontally.

67. Fig. 5. Brush made of split bamboo used in sweeping the tea leaves out of the pans.

68. Fig. 6. Basket for receiving tea from the pan when ready to be rolled. It is 2 feet long and $1\frac{1}{2}$ feet broad, and gradually increases in depth from before backwards to 6 inches. It is made of bamboo.

69. Fig. 7. Mat made of bamboo for placing on the table when the tea leaves are about to be rolled. It is 8 feet long and 4 feet broad.

70. Fig. 8. Flat basket made of bamboo for spreading out the tea leaves when they have been rolled on the mat. These flat baskets are of various sizes, varying from 3 to 5 feet in diameter.

71. Fig. 9. Flat sieve basket, of 2 feet in diameter, made of bamboo, upon which the rolled tea leaves are placed, and which is deposited in the centre *A*, of the double-coned basket.

72. Fig. 10. Double-coned Baskets. The height of these baskets varies from 2 feet 2 inches to 2 feet 6 inches, external diameter 2 feet 8 inches. In the centre at *a*, there are some small pegs of bamboo to support the flat sieve basket on which the tea rests.

73. Fig. 11. Forked stick for turning leaves.

74. Fig. 12. *Choolahs*. These are formed of *kucha* bricks, and are 10 inches high, $10\frac{1}{2}$ inches deep, and generally about 2 feet in diameter, in (fig. 12 *a*.) a double-coned basket is represented placed on a *choolah*.

75. Fig. 13. Funnel made of bamboo to allow the heated air from the *choolahs* to pass through the tea: it is seldom used. The Chinese tea manufacturers preferring one made in the tea basket by the hand.

76. Fig. 14. Oven for firing green tea made of *kucha* bricks. The pans *a*, *a*, are inclined at an angle of 50° . In front the

oven is 3 feet 2 inches in height, behind 4 feet 8 inches, length $5\frac{1}{2}$ feet, breadth 3 feet. Door 10 inches from the base, 1 foot 2 inches high, and 7 inches wide.

77. Figs. 15, 16. Frames for placing baskets. The first being inclined.

78. Figs. 17, 18. Baskets for collecting leaves.

79. Figs. 19, 20, and 21. Shovel, &c. used in regulating the fire.

80. Fig. 22. Winnowing machine. This is a common winnowing machine, with a box 2 feet 10 inches in length, 1 foot 2 inches in breadth, and 1 foot 3 inches in depth, attached to the bottom of the hopper, and closely fitted into the middle of the circular apartment which contains the fanners. This box is entirely closed above (unless the small opening receiving the hopper) and at the sides. At the base there are two inclined boards which project from the side of the machine 6 inches, and are partly separated from each other by angular pieces of wood. The end towards the fanners is open, the other is partly closed by a semicircular box which is movable.

81. *A, A, A*. Apartment containing fanners which is all closed but at *B* and *C*. *D*, handle or crank for propelling fanners. *E*, apartment through which the air is propelled from the open space *B*, in the direction of the arrows. *F*, hopper. *G*, flat piece of wood to regulate hopper. *H*, angular piece of wood to shut the hopper by being placed under the regulator. *I, L*, base of ten receiving apartments, divided into two compartments, and projecting laterally and obliquely downward for 6 inches, and down which the tea proceeds. *N*, semicircular movable box, which receives all the lighter particles of tea. *K, M, O*, boxes placed to receive the tea.

82. I shall now give the dimensions of the different parts of this machine which may be useful to parties wishing to make up similar ones to those employed in the manufactories.

83. External frame, 7 feet 2 inches in length, 18 inches in breadth, and 5 feet 8 inches in height. Hopper 2 feet 10 inches above, and 1 foot 8 inches in depth. Frame of box of fanners, 3 feet 9 inches in diameter. Hopper frame 2 feet 7 inches. Semicircular box, in length 2 feet 5 inches and 7 inches in depth. Inclined plane at base, first 15 inches, second 13 inches.

84. I may briefly state how this machine acts. With the right hand the fanners are propelled by the crank at *D*, and with the left hand the bottom of the hopper is opened by removing the wood at *H*. The flat piece of wood *G*, (the regulator) is held in the hand to regulate the quantity of tea that passes down. An assistant then throws a quantity of tea into the hopper (fig. *F*), which escapes through the bottom into the apartment *E*, and there meets the air marked by arrows. The first kinds of tea fall down the inclined plane *I*, into the box *K*, which has been placed to receive them, the second are propelled further on, and fall into the box *M*, and the lighter particles are propelled on to the semicircular end *N*, and fall into the box *O*.

XXII.—*Concluding Remarks.*

85. In concluding this report, I must beg to acknowledge the assistance that I have received from Mr. George Lushington, who takes a lively interest in the extension of the experiments now conducting. To Captain H. Ramsay, Senior Assistant Commissioner, Gurwahl, I am indebted not only for assistance in clearing the jungle in order to extend the tea plantation at Guddowli, but also for the interest he has evinced in bringing about a tea trade with the Bhotiahs of Niti Bampa, Mulari and other frontier towns. At his suggestion several boxes of Bohea tea were made over to the principal men of the above villages, and which have been by them exported to Dhumpoo, in Chinese Tartary, for sale. The Bhotiahs on the Kumaon frontier have also been encouraged

by Mr. Batten, Senior Assistant Commissioner, to purchase Bohea tea for a similar purpose, and to them six boxes have been sold. The result shall be the subject of a future communication.

WM. JAMESON,
Supt. Bot. Gardens, N. W. P.

OFFICE OF THE SUPT. BOT. GARDEN, N. W. P. :
Camp Kumaon, 30th July, 1847.

APPENDIX (A.)

List of Boxes of Tea sold by Auction at Almorah, on the 22nd July, 1846.

No. of boxes.	Description of Tea.	Year of Manufacture.	Quantity.	Name of Purchasers.	Rate per pound.	Amount.	
						Rs. A. P.	Rs. A. P.
23.	Pouchong,	1844,	10 „	Moti Saha, ..	2 4 0	22	8 0
24.	Ditto,	„	10 „	J. Strachey, Esq., ..	2 13 0	28	2 0
25.	Ditto,	„	10 „	Ditto ditto, ..	2 13 0	28	2 0
26.	Ditto,	„	10 „	Ditto ditto, ..	3 1 6	30	15 0
27.	Ditto,	„	10 „	J. H. Batten, Esq., ..	3 1 0	30	10 0
28.	Ditto,	„	10 „	Moti Saha, ..	3 4 0	32	8 0
29.	Ditto,	„	10 „	Ditto ditto, ..	3 4 0	32	8 0
30.	Ditto,	„	10 „	J. H. Batten, Esq., ..	3 4 6	32	13 0
31.	Ditto,	„	6 „	J. Strachey, Esq., ..	3 10 0	21	12 0
22.	Ditto,	1845,	10 „	Secram Saha, ..	3 6 6	34	1 0
23.	Ditto,	„	10 „	J. Strachey, Esq., ..	3 8 6	35	0 0
24.	Ditto,	„	10 „	Moti Saha, ..	3 8 6	35	0 0
25.	Ditto,	„	10 „	Secram Saha, ..	3 8 6	35	0 0
26.	Ditto,	„	10 „	Moti Saha, ..	3 8 6	35	0 0
27.	Ditto,	„	10 „	J. H. Batten, Esq., ..	3 9 0	35	10 0
28.	Ditto,	„	10 „	Mr. Dunbar, ..	3 9 0	35	10 0
29.	Ditto,	„	10 „	J. H. Batten, Esq., ..	3 10 0	36	4 0
30.	Ditto,	„	10 „	J. Strachey, Esq., ..	3 9 0	35	10 0
31.	Ditto,	„	10 „	Moti Saha, ..	3 9 0	35	10 0
32.	Ditto,	„	10 „	Ditto ditto, ..	3 9 0	35	10 0
34.	Ditto,	„	10 „	J. Strachey, Esq., ..	3 9 6	35	15 0
35.	Ditto,	„	10 „	Ditto ditto, ..	3 9 0	35	10 0
36.	Ditto,	„	10 „	J. H. Batten, Esq., ..	3 9 0	35	10 0
37.	Ditto,	„	10 „	Ensign Norman, ..	3 10 0	36	4 0
38.	Ditto,	„	10 „	Secram Saha, ..	3 9 6	35	15 0
39.	Ditto,	„	10 „	Moti Saha, ..	3 9 0	35	10 0
40.	Ditto,	„	10 „	Secram Saha, ..	3 9 6	35	15 0
41.	Ditto,	„	10 „	Mr. Dunbar, ..	3 9 6	35	15 0
43.	Ditto,	„	10 „	Moti Saha, ..	3 9 0	35	10 0

APPENDIX (A.)—(Continued.)

List of Boxes of Tea sold by Auction at Almorah, on the 22nd July, 1846.

No. of boxes.	Description of Tea.	Year of Manufacture.	Quantity.	Name of Purchasers.	Rate per pound.	Amount.
			lb. oz.		Rs. A. P.	Rs. A. P.
44.	Pouchong,	1845,	10 "	Moti, Saha,	3 9 0	35 10 0
45.	Ditto,	"	10 "	Ditto ditto,	3 9 0	35 10 0
46.	Ditto,	"	10 "	Ditto ditto,	3 9 0	35 10 0
48.	Ditto,	"	10 "	G. T. Lushington, Esq.,	3 10 0	36 4 0
49.	Ditto,	"	10 "	Moti Saha,	3 9 0	35 10 0
51.	Ditto,	"	10 "	Ditto ditto,	3 9 0	35 10 0
52.	Ditto,	"	10 "	Ditto ditto,	3 9 0	35 10 0
53.	Ditto,	"	10 "	Secram Saha,	3 9 6	35 15 0
54.	Ditto,	"	6 "	Mr. Dunbar,	3 11 6	22 5 0
..	Total, lb.	..	372 "	Total,	Co's. Rs.	1,280 5 0

(Signed) D. MALLACH, *Sergt. Major, Auctioneer.*

ALMORAH : 22nd July, 1846.

(True copy,)

WM. JAMESON,
Supt. Botanical Gardens, N. W. P.

On the culture of American Cotton in India, and the proper time for sowing it in various localities. By Dr. ROBERT WIGHT, Superintendent Government Cotton Farms, Coimbatore.

A week's absence from home visiting our farms, which are located some miles from Coimbatore, has prevented an earlier acknowledgment of your letter. These, I am happy to add, are all advancing favorably, and promise satisfactory returns. The only portion regarding which I have as yet any doubts are two or three fields sown earlier than I consider quite judicious. This measure was adopted experimentally in accordance with a suggestion from the Manchester Commercial Association, based on a knowledge of the habits of the plant

as observed in its native country, Mexico, but which seems scarcely applicable to these portions of India under the influence of the NE. monsoon.

The facts communicated by the Association, combined with the knowledge acquired here, of the habits of the plant, has induced me to endeavour to ascertain some general rule applicable to all localities, for determining the proper time for sowing American cotton in India.

Circumstances which were by their consequences deeply impressed on my memory, occurred at an early stage of our proceedings here, and have hitherto served as a guide to our subsequent operations, but empirically, not on any ascertained fixed principle. From the information then and since obtained from all quarters, I have recently deduced a theory applicable to all stations, which, being based on the known habits of the plant, must be correct. I am almost quite prepared for being laughed at for introducing my formula! with all the seriousness of a real discovery, considering that it is neither more nor less than a self-evident truism; but still, it is one which, I do not think has been kept sufficiently in view in the management of these cotton experiments, and the want of attention to its bearing on them, has, I suspect, led to the belief that, in India, American cotton is a less certain crop than it really is, when the principle about to be stated is duly kept in view.

I find that in the climate of Coimbatore, the Mexican, or, as now generally called, the New Orleans cotton plant, requires, in average seasons, from the time of sowing until the expansion of its first blossoms, from six to eight weeks, and from the fall of the flower to the bursting of the mature capsule, about as much more. The first of these periods may vary, though not materially, according to the soil, the situation as regards exposure to high winds, the quantity of rain; and it may be delayed or advanced a little by agricultural treatment.

From fourteen to sixteen weeks may therefore be assumed as the period that intervenes between the sowing and first pickings of the crop. At the end of that time, the weather during the interval having been seasonable, and the monsoon of average quantity, so as properly to soak the ground, the plant should be in full vigour, nearly full grown, and loaded with crop in all stages, from the embryo form to the open bole ready to pick. This is the critical period of the crop. Should the rains cease and be followed by bright clear weather, the full grown boles will rapidly open and fresh ones continue to advance for two, three, or if the plants have been refreshed by an occasional shower, even four or five months, and in the end, on good lands, yield probably as much as a thousand pounds per acre. But if on the other hand the rains are protracted for a week or two longer, the plants become overcharged with watery juices, the more advanced boles constituting the finest portion of the crop do not open, the cotton absorbs moisture from the capsule, which, having no means of escape, rapidly rots or otherwise deteriorates its quality. From this history of the progress of a cotton crop from the seed to the ripe bole, it will be seen that we must endeavour so to arrange our sowings as to allow a growing season of from twelve to fourteen weeks to intervene between the date of sowing and expected conclusion of the monsoon. The sooner our pickings commence after the rains have ceased the better will be our crops.

Guided by the facts on which the principle rests, and knowing that the NE. monsoon in these western districts is usually of short duration, I consider July the most favorable month for sowing. August would probably be preferable if we could equally depend on having rain, an expectation which four years' experience does not justify, as in that case we could almost make sure of escaping the destructive effects of a late or excessive NE. monsoon. This season, as above stated, two fields were sown on the first of June, two more on

the 15th ; and about the 25th of that month, the regular sowings commenced and continued until nearly the end of July.* One farm, situated more in the direct line of the SW. monsoon, had much more rain than the other, which delayed the work, so that it was not finished until the 10th of August, thus affording us a continuous series of sowings, extending over two consecutive months to compare with each other as to final result. One low-lying field is still reserved to a later date, as wet lands are unfavorable for the cultivation of cotton by producing effects similar in kind to those arising from unseasonable rains on dry ones. In a word, I have never found cotton succeed well on what is technically called a "wet bottom;" the plant grows well, but the crop always falls short, and much of the staple is damaged. The fields sown on the 1st and 15th June are now far advanced, the former in full flower and many nearly half-grown bolls to be met with, which should be ripe about the end of September, in which case the bulk of the crop will be coming on in October, about the time of our heaviest rains ; and if they are in average quantity, I anticipate the greater part will be lost.

In applying this rule to other portions of India it may, I think, be laid down as a rule that, all along the eastern coast of the Peninsula, the last week of August and all September will be found favorable for sowing : the NE. monsoon being much more abundant and of longer duration there than in the interior. And in countries subject to the SW. monsoon, the last week of May and all June will probably be found the most suitable seasons : the exact time being determined by the individual season and average duration of the rains at each station.

Cases will of course often happen, where, owing to favorable rains occurring at a season which may be considered a little too early to be quite safe, the cultivator may be perplexed, not wishing to lose a favorable opportunity which might be withheld at the proper time. In such cases the safer plan is

to advance, as the plant is one possessed of great power of resisting heat and drought should they follow, and is ever ready to take advantage of the first rains that fall: if on the contrary the weather continues moist, and there is danger of the plant advancing too rapidly, its progress may be, to a considerable extent, retarded by delaying to hoe and loosen the soil about the roots, which certainly produces that effect. If, on the contrary, the sowing is unavoidably delayed, the loss of time can be materially compensated by early and repeated hoeings.

The course adopted here is to hoe and thin out to about half what will be required as soon as the first or second proper leaves (between the seed lobes) begin to show themselves. That is, in about ten days or a fortnight after the plant is above ground: in about a fortnight or three weeks after, the plant being then four or five inches high, the ground between the rows is loosened by being ploughed with the native plough: and lastly, in two or three weeks more, they get their second hoeing and final thinning. From this time little is required except in fields overrun with grass and weeds, in which case these operations require to be repeated.

Before finally quitting the subject, I may mention with regard to Bourbon cotton, that I have not yet ascertained with equal certainty its rate of progression towards maturity, and cannot state with the same precision the time that should be allowed for its growing season. But knowing that it is much slower than the American plant, I had it this year sown about the middle of May, thereby giving it a longer season by fully six weeks. The whole of that time, judging from the present comparatively backward appearance of the plant, will be required to bring it into crop about the same time with the New Orleans, its growth being so much slower.

August 16th, 1847.

*Note on the culture of the Tea Plant at Darjeeling. By Dr.
A. CAMPBELL, Superintendent of Darjeeling.*

I feel assured that it will interest the Society to know that I have instituted an experiment on the culture of the tea plant at this place. It is my intention to keep the Society informed on its progress, and I shall therefore note particulars from the beginning.

About six years ago I received a few tea seeds from Dr. Wallich; they were of China stock, grown in Kumaon. I planted them in my garden in the month of November 1841, and had about a dozen seedlings in the month of May following, which were allowed to grow where they had come up, and rather close together. The plants were healthy from the commencement, and up to May 1844 had grown very well: at this period the ground passed into other hands (Mr. Samuel Smith's), and I lost sight of them until last August, when Mr. Macfarlane from Assam, who was acquainted with the tea plant in that province, arrived here. Being desirous of ascertaining how far the climate and soil of Darjeeling were suitable to the tea I took him to examine the plants, and begged of him to record his opinion on their growth and qualities with reference to their age and his experience of the plant in Assam. The result was quite satisfactory, as Mr. Macfarlane concluded his note on the subject by saying, that the plants were in a very healthy condition, and had they been in the hands of a cultivator, would now be giving a very fair supply of produce. Encouraged by this result I determined to give an extended trial to the plant, and through the kindness of Major Jenkins and Captain Brodie of Assam, I procured a supply of fresh seed in October and November last, which was planted in November and the early part of December.

The seed was of excellent quality. It commenced germinating in March, a few plants appeared above ground in

the early part of May, and now I have upwards of 7000 fine healthy seedlings in the plantation.

For the information of those who may desire to try the tea culture in this soil and climate, I have to state the mode of planting pursued by me, and other particulars. The ground is a gentle sloping bank, facing the north and west ; the soil is a reddish clay mixed with vegetable mould. After taking up a crop of potatoes, and carefully preparing the ground, I put in the seed in rows six feet apart and six feet distance in the rows. The seeds were placed about three inches under the surface, five in number, at each place about four inches apart thus :— On an average, two out of the five have come up. The seedlings commenced appearing above ground early in May, and continued to show until the end of July. The earliest were therefore six months in the ground ; the latest about eight months.

The seed was of China stock, grown in Assam, and of the Assam plant mixed. I am anxious to have the China stock only, and purpose separating the plants of the Assam stock as soon as I can distinguish them, which Capt. Brodie informs me, can be readily done as they grow up : the China plants being of a darker color, and smaller than the Assam ones.

I hope to have a supply of the seed of China stock from Kumaon next November, and with it to cause the extension of the experiment at this place. If the Society has any suggestions to make, I shall be most happy to attend to them.

I think that it is reasonable to expect quite as good tea to be produced here as in Kumaon.* I have not tasted the Kumaon tea, but from the opinion expressed on it in England, I am satisfied that it is a very drinkable beverage, and that with similar success here, the tea will be a valuable addition to

Dr. Jameson, in a late communication to the Society, remarks—"From the accounts I have received of the climate of that place (Darjeeling), I doubt not but that the plant there grown will yield tea of a superior description."—Eds.

our products. If you can send me a sample of Kumaon tea I shall be much obliged. I have recently tried two kinds of the Assam tea presented by Mr. Stokes to a friend. They are excellent teas, and I shall be well content to have an equally good article manufactured here.

Mr. Macfarlane's report on the tea plants in Mr. Smith's ground is annexed.

August 13th, 1847.

According to your request I have the pleasure of transmitting you my opinion of the tea plants in your garden in this place. The two larger plants have made very good progress, considering their closeness to each other, which prevents them from throwing their branches freely in every *direction*, but as they have attained so great a size, I would not recommend their being transplanted; because, let it be done ever so carefully, the roots must receive more or less injury, and should the injury be great the death of the tree is certain.

The smaller ones on the contrary are much stunted; this is caused by their confined situation, being completely choked up by the rose trees, which prevents their receiving a proper supply of light and air so necessary to vegetation. They are also planted too closely, and, as the plants are still small, by availing yourself of the most favorable season, and using great care in the operation, they might be transplanted with safety, and should then be placed at a distance of not less than six feet apart. The difficulty of transplanting is occasioned by the depth to which the root penetrates, as it generally grows downwards, and in a large tree is principally in the subsoil. The larger plants should be pruned of their lower branches to allow a free current of air. This operation is generally performed in November, but any time during the cold season or before the rains, while the plant is at rest, would answer:

as I have no knowledge of this climate, I would leave it to more experienced persons to judge of the proper season. To conclude, the plants are in a very healthy condition, and had they been in the hands of a cultivator, would now have them giving a very fair supply of produce.

The small sample I tried was of a very good flavor, but on account of the defective manner of manufacture, for want of proper materials, no proper judgment can be formed.

(Signed) A. MACFARLANE.

August 18th, 1846.

*On the export of Wheat from India to England. By
Professor ROYLE.*

[Communicated by the Government of India.]

Wheat, having been known to the earliest of the civilized nations of antiquity, is probably a native of the central parts of Asia, whence its cultivation has been carried north into Europe, and south into India, presenting, what appears to us, the anomaly of a grain of cold countries being cultivated in what is so peculiarly a hot one. It has sometimes been thought that the species might be different, but it is in fact, the season of cultivation which differs. Wheat, with barley, being sown in the plains of India in the month of October, and reaped in March, while in the Himalayan Mountains, these are sown in the spring, and reaped in autumn.

Great varieties of wheat are known in Europe, which are sometimes divided into summer and winter wheats, and the latter into red and white wheats, and also into those which are bearded and awnless. But all these are now considered to be derived from one species, the *Triticum vulgare* or *sativum* of botanists. To this may be referred nearly all the varieties known in India. A few other species of wheat are distinguished by botanists as *T. turgidum*, or duck-bill wheat; *T. durum*, or Barbary wheat; *T. amyleum*, starch wheat, and *T. compositum*, or Egyptian wheat; but these, and even the last, differing so remarkably in appearance as it does, are thought by

others to be only varieties due to the varied culture of common wheat. *T. polonicum*, or Polish wheat; *T. spelta*, spelt wheat, and *T. monococcum*, or one-grained wheat, appear to be distinct species.

Though the produce of wheat cultivation varies according to the influence of soil and of climate, as well as according to the culture, and to the kind of manure employed, as also the variety of seed employed, yet it is sometimes useful, for the sake of comparison, to know what is the average rate of product. It has sometimes been calculated that the weight of straw is double that of grain obtained. Professor E. Solly states, that "a crop yielding 5 qrs. (or 40 bushels) per acre, would consist of about 23 cwt. of grain, 4 tons of straw, and "30 cwt. of stubble and roots; the latter of course remaining in "the soil."—*Rural Chemistry*, p. 213. Of grain, the maximum return per acre is about 70 bushels, but the average return for the whole of Great Britain is reckoned to be about 25 bushels per acre. The grain is readily separated in the process of grinding into two portions, one, the husk forming bran, which varies in proportion from 11 to near 40 per cent. to the kernel, or part which forms flour. In good thin-skinned and *soft* wheats, the husk is easily separated, but in those which are *hard*, some of the husk becomes ground up with the flour, and darkens its color. But bran always contains a portion of starch and other soluble matters.

When analyzed, English wheat is found to contain from 15 to 17 cent. of water, or about one pound in every six pounds of fine flour; also, starch, with a little sugar and gum, and gluten, with a little vegetable albumen and caseine, with some oil, which is partly washed out with starch, while a part remains attached to the gluten. These constituents may be distinguished into those which contain nitrogen, that is, the gluten, albumen and caseine: and into those which are destitute of it, as the starch, sugar, gum and oil. The nitrogenous principles approaching nearest to the nature of the flesh of animals, are considered the most nutritious; and wheat, for containing more gluten, &c., than other grains, is considered the most nutritious of any: but in England, the wheats which contain the most gluten are not so much esteemed as those which abound in starch, chiefly in consequence of these being softer, and producing a whiter flour. The glutinous wheats are chiefly produced in warm

countries as Sicily, Italy and the Crimea : they are harder in nature, hence called *flinty*, and, being more difficult to grind, are objected to by millers. But they are preferred in southern countries for their nutritious qualities, also for making excellent macaroni, vermicelli, and also biscuit. They also make about 5 per cent. more of bread than the white mealy wheats. Professor Johnston (Agricultural Chemistry, p. 732) states, that "the quality of gluten contained in English flour has generally been stated much too high : " it "seldom contains more than 10 per cent. of dry gluten."* As wheat forms the principal food of the inhabitants of North-west India, and is cultivated in many parts of that country, it has often been suggested as a profitable export to England, and that the improvement of its quality and culture was a subject well worthy of attention. The Agricultural Society of India has frequently turned the notice of its members to this subject, and obtained wheat for seed from England as well as other countries. Wheat, as well as other cereal grains, has also been frequently sent in small quantities from the India House to different parts of India.

That it has been thought practicable to export wheat from India to Great Britain with profit, may be inferred from the petition to Parliament from the Agricultural Society of India, praying for "the admission into the ports of Great Britain of wheat from this country, on the same terms as have already been conceded to wheat

* In addition to English wheat, it is desirable to know the composition of wheats of other countries, as some of these approximate nearer to the wheats of India. The accompanying table is therefore given.

Table of the composition of French and Odessa flour, as determined by Vauquelin.

	French.	Odessa Wheat.	
		1st Quality.	Flinty. Soft.
Water,	10.0	12.0	10.0
Gluten,	11.0	14.6	12.0
Starch,	71.5	56.5	62.0
Sugar,	4.7	8.5	7.4
Gum,	3.3	4.9	5.8
Bran, .. .. .	..	2.3	1.2
	100.5	98.8	98.4

“from Canada.” A Committee of the Society had previously collected information from various districts of Bengal and of the North-Western Provinces, on the cost of producing, and on the practicability of exporting, wheat in a good condition with profit, from India to England. The Committee reported (vide Trans. Agric. Soc. 1843, pp. 237-318,) that “some of the finest wheat countries are to be found in the vicinity of our Calcutta market; but beyond Behar, the distance would appear to be too great to allow of a profitable import at the present high rate of transport.” From the nearer districts, it appeared that wheat could be landed in Calcutta for Rs. 1 to Rs. 1-12 per maund: its average being Rs. 1-5-6. The average selling price at Calcutta for the year was then Rs. 1-13-4; whence it was calculated, that a profit of 37 per cent. was available to the grower or country dealer. “The returns from the higher provinces show a range of from Rs. 1-10 to Rs. 2-12 per maund as the price of landing good wheat in Calcutta. Its average being Rs. 2-1-2; showing an advance on the Calcutta rate before stated (Rs. 1-13-4) of 3 annas and 11 pie, or a loss of more than 12 per cent.” The Committee further observe—“Besides this, the residents of the higher provinces being themselves large wheat consumers, we can hardly expect perhaps for sometime to come, that much wheat will be drawn thence for export.” The greater cheapness of the wheat cultivation of the lower provinces is due in a great measure to its being carried on in the land near the banks of rivers, which has been inundated during the rainy season, and has not there completely dried up. The greater dearness of the North-West Provinces seems to be chiefly owing to the greater expense of irrigation, as two or three of the reporters state, that the cultivation could be greatly extended and the price of wheat much cheapened, if the Ganges canal were completed. The culture, though upon the whole careless, seems to give good returns, as the produce per acre of many villages is stated to be above 25 bushels per acre, of others as much as 42 bushels to the acre, and in one village of the Doab, the produce is stated to be as high as 83 bushels per acre.

At the time that the above report was made, it was also calculated by others that the average cost of wheat at Calcutta being Rs. 1-12 per maund, which at a rough estimate is about 28 shillings a quarter,

and to which having added 25 per cent. for freight and other charges, the wheat could be landed in England for about 53 shillings a quarter. This was at a time when the best English wheats were selling in England for 55s., and the inferior kinds for 44s. a quarter.

Both previous and subsequent to 1843, small quantities of wheat have formed a part of the exports from India to England, and some has also been imported during the present year, but we are unacquainted with the details of any of the transactions. But it is evident, that, supposing it to be of such a quality that it is likely to travel well, it can only, at the above prices, be imported when wheat of the same quality is above 53 shillings a quarter. The quality of Indian wheat and the state in which it can reach England from India, will be considered in a subsequent part of this paper.

As the above information refers only to the Bengal Presidency, we have the "Notes on Indian Agriculture" by Dr. Gibson, which supply data for similar knowledge respecting the wheat cultivation of the Bombay Presidency. He states, that "wheat is grown chiefly "above the Ghats in the Dekkan, Khandesh, and the Carnatic, "also most extensively in Guzerat, even to the sea border. It is "also extensively raised in many level table-lands met with before the "Ghats, and often down to the flatter plains ; and on such high levels, "the same measure of grain is found to weigh about one quarter more "than a similar quantity raised in the more plain country." The land best fitted for the culture, is the strong black soil, as it retains sufficient moisture to mature a crop even without the aid of after-showers. Rotation is "necessary and universally practised, but not "always until two or three crops in succession have been taken from "the ground." The crop is valued not only on account of the grain, but also for the chaff which "is carefully set apart as a most necessary provision for bullocks, and stored until the season when "other provender is scarce." Of the best varieties, *Bakshi*, is always raised on irrigated, and the *Daood Khani*, as "a dry crop, fitted only "for the best soil." "The produce does not generally exceed "1,200 pounds (20 bushels ?) per acre, and is most frequently short "of this quantity." The price varies "from 60 to 90lbs. per Rupee, "i. e. it may be said to vary from 10 to 16s. per quarter."

We have further information from a Government experiment made in 1843 by Dr. Burn in Broach, in consequence of a portion of land under cotton cultivation having been thrown out of culture by excess of moisture. About 23 acres of land (46 beegahs) were sown with wheat in November and reaped by the middle of March. The produce was "742lbs. an acre, and, taking the bushel at 60lbs. there were 12 bushels and 22lbs. per acre." The expenses of culture, including land rent, were Rs. 532-10-3. A portion of the produce (the inferior wheat and chaff) was sold at Broach for Rs. 59-14-8. If the remainder had been sold there at the market price of Rs. 10 per 656lbs., the sum would have amounted with the above Rs. 59-14-8, to Rs. 277-14-2; entailing a loss of Rs. 254-12-1 upon the whole expenditure, or Rs. 5-8-7 upon each beegah. (Through anticipating, it may be here stated, that Rs. 157-2-0 were realized upon the whole produce, after paying all expenses.)

About 30 quarters of this wheat were sent to Bombay for shipment to England, as one of the objects of the experiment was to obtain definite information on the exporting of wheat from the west of India. The following expenses were incurred :—

Wheat grain, rate of cost.	Per Kulsī of 656 lbs.	Per Quarter of 480 lbs.
Cost of cultivation,	21 11 0½	15 13 11
Packing and Shipping from Broach to Bombay, ..	4 8 2½	3 4 10½
Shipping, Insurance, &c. at Bombay, .. .	2 7 3½	1 12 8½
Freight to Liverpool,	9 13 9½	7 3 6
Total, Co's. Rs.	38 8 4	28 3 0

Dr. Burn states : "if the above sums be correct, then 56 or 57 shillings per quarter (the rate of exchange being about 2 shillings) will be about the cost of the grain in Liverpool, duty unpaid." But it must be observed, that at the same time that this wheat cost Rs. 21-11-0½ per kulsī, wheat of the same quality was selling at Broach for Rs. 10 per Kulsī of 657lbs. This, Dr. Burn explains, "by the natives having no pecuniary charge for laborers, &c.," and says, that "Rs. 10 per kulsī, although it admits of but small profit to the native cultivator, would allow of the grain being landed in Liverpool at Rs. 26-13-3½ per kulsī, or Rs. 19-10-2 per

“quarter,” that is, under 40s. a quarter. But in 1845, when Dr. Burn was directed to make a fresh experiment for Government, by merely purchasing wheat at the market price, and sending it to Bombay for shipment to England, he writes on the 10th March 1846, that he “was forced to relinquish the attempt from the too high price of grain.” It being then 22 Rupees per kulsī, in consequence of a bad season (or more than 4s. per bushel, without all the expence of freight, insurance, &c.) The wheat sent to Liverpool having been partly damaged, was sold there at “5s. per bushel for the sound, and 3s. 6d. for the unsound portion of it : the average price of wheat in the London market, at the same period, being 6s. 10d. per bushel.” The results of this experiment were certainly discouraging, as stated in the letter of the Court of Directors (16th July 1845,) to the Governor in Council at Bombay. The Chamber of Commerce also, of that place, gave their opinion, that “the experiment had turned out very unsuccessfully :” and on the 24th December, 1845, “they hardly think that, in the present state of matters, any mercantile firm would be disposed to export wheat to England as an experiment, since the risk of failure would be greater than any measure of success likely to be attained would justify it in incurring.”

Wheat is also cultivated in Mysore, as described by Dr. Buchanan, and in other parts of the Madras Presidency, but I have been unable to obtain any recent information on the subject. It is extensively cultivated in some parts of Scinde, but especially in Upper Scinde, where the grain is said to be cheap, but I am unacquainted with its exact price, or the expense of conveying to Bombay.

In connection with the price, a very important consideration is the state in which wheat can be landed in England. It is well known that even from the south of Europe and from Egypt, wheat is sometimes received in a damaged state from the destructive inroads of the weevil; but it is also received in a sound condition from the greater distance and longer voyage from Taganrog and Odessa. So from India, it has often been received in so damaged a state from the inroads either of the rice weevil (*Calandra Oryzæ*) or from the granary weevil (*C. granaria*), that it is generally considered hopeless to send it in a sound condition. Mr. Wood of

the Strand Mills, Calcutta, however states, that when at Sydney, he was in the habit of receiving large quantities of wheat from Calcutta and grinding it, and has known it after a passage of 72 days, and being 4 months stowed in a godown, to be quite free from weevil or fly. I have myself received samples of wheat which have been shipped in considerable quantities, and arrived here in a sound condition. The Agricultural Society of India state—"We have, however, proof, that wheat, *properly cured*, has lasted under much exposure for upwards of 18 months: that it has been sent to England, and returned to this country in good condition; and has obtained a remunerative price, and borne a fair comparison with British and other European produce." So in Dr. Burn's experiment it is stated,—“The grand point to decide was, can *wheat from Bombay be landed at Liverpool in a sound state, that is, free from weevil, or not?* and so far as is shown by the reports in the present trial, this question has been satisfactorily answered in the affirmative.” Flour, it is well known, has been sent in considerable quantities from Calcutta to England, but this usually arrives in a sour state, when it answers admirably for sizing. The best practical rules for sending wheat, appear to be, first exposing it sufficiently that the grain may become hardened, taking care at the same time to keep it from old storehouses, or old sacks, where the weevil chiefly abounds; * having it carefully cleaned; and, I am told, that it is essential to have the grain unmixed with other varieties; also, not to ship too large a quantity in one vessel, as it is apt to heat; and also to avoid shipping in moist weather. Besides these points, it is of still greater importance to select only the best and heaviest wheats for shipment.

The most important point, however, to ascertain respecting Indian wheats, is their quality in comparison with others met with in the English market. Though several varieties are known, they seem all

* The efficacy of precautionary measures must depend upon a correct knowledge of the habits of the weevil in a hot country like India. These require to be carefully studied there by a competent naturalist. See an excellent account by Mr. Curtis (Journ. Agri. Soc. of England Vol. iii, part i,) republished in Journ. of the Agri-Horticultural Soc. of India, 1846, App. pp. 148-155.

to be derived from *Triticum vulgare*, or common wheat. Dr. Buchanan, however, does mention *T. monococcum* and *T. spelta* as being cultivated in Mysore. The most common varieties are the *white* and *red* wheats, the flour of the first is in some places much esteemed, but in others the red wheats are considered the most nutritious. Of the varieties of wheat (about 20 in number, from different parts of India) in my possession, the finest specimens, both of white and of red wheats of India, are those sent by Col. Ouseley to the Agricultural Society of Calcutta, and which were produced in the inland districts of the Nerbudda valley. Of the five varieties sent, two were excellent specimens of their respective kinds, and may therefore be adduced as samples for comparison with other Indian wheats. No. 5 called *Pissee*, but *Doodea* in Calcutta, is a white mealy wheat, considered both in Calcutta and London to be an excellent sample of a soft white wheat, and worth at present about 90s. a quarter in this country. It weighed 63lbs. to the bushel, and being considered equal to the best English wheats, is no doubt the kind best suited for export to this country, the more especially as in the country where it is produced, it is considered inferior, less nutritious, and sells for only 3 Rupces for 200 seers, while another kind, the *Julalya*, sells for Rs. 4-4-0 for the same quantity. This *Julalya*, called *Gungajelly* in Calcutta, is No. 1 of Colonel Ouseley's wheats. It weighed 61lbs. to the bushel, and is an excellent specimen of a *hard* wheat, worth at present about 80 shillings the quarter, finding a ready sale, at the same time that it travels well. As a proof it may be mentioned, that the specimen, though sent by Col. Ouseley in June 1843, is still in excellent order. Of the other kinds, No. 3 or *Satya*, and No. 2 or *Kutya*, are not considered desirable for shipment, as being mixed, though both weighing 60lbs. to the bushel, and therefore likely to travel well. No. 4 or *Sohalya*, is considered too light, weighing only 57½lbs. to the bushel, that is, about the same weight as Egyptian wheat, and in other respects also most like it. The *Mooltanee* wheat in my possession, is considered a *thin* and *stinty* wheat, which would probably not be esteemed here, though it is thought highly of in Northern India. The Indian wheats partake in general of the characteristics of the *hard* wheats of warm countries, such as Sicily and the Crimea. This *hardness*

is probably due to climate, but being a characteristic of those wheats which contain the largest proportion of gluten, so far from being an objection to such wheat as an article of diet, is actually its strongest recommendation, because an indication of the presence of much nutritious principle. The prejudice may therefore be expected to disappear with the increase of information. Of the Broach wheat sent by Dr. Burn, the Liverpool brokers say, it is "very similar in quality and value to what is grown in Sungrum and Patras, and which cannot be purchased in those countries under an average of 22s. per quarter." They also say; "this is used for mixing in bread stuffs, and also for sizing purposes, the demand for which is yearly increasing." The public will, however, become accustomed to these more glutinous wheats, as more of those of the south of Europe and of America are imported into this country, to all of which the generality of Indian wheats approach nearer than to those of Great Britain. In conclusion, it may be stated, that the opinions given by Mr. Bois, whom I consulted here, coincided with those of Mr. Haworth of Calcutta.—*Vide Trans. Agri. Soc. of India*, 1843, pp. 450 and 538.

Correspondence regarding the "Pooah" fibre of Nipal and Sikim, a species of Nettle, and the "Oadal," Sterculia villosa; with a report on their qualities.

I have the pleasure to bring a new sort of hemp to the notice of the Society on behalf of Serjeant Grutcher, who is a professional worker in leather, and uses it in his craft. The Serjeant considers it equal to Russia hemp, for shoe and saddlery work, and purposes, if a demand shall arise for it, to prepare and supply it to the Calcutta market.

I shall shortly describe the plant, the method of preparing the hemp, with some other particulars, and will request of you to be so kind as to have it submitted to a comparative trial with the *sunh* and European hems, and favor me with

the result : also adding, if possible, the price it would fetch per maund in the Calcutta market.

Description of the plant.—The plant from which the hemp is made is called *Pooah* by the Parbuttias, *Kienki* by the Lepchas, and *Yenki* by the Limboos. It is like a nettle, and is one probably, although I cannot determine the question. I have however the pleasure to submit herewith the leaves, seeds just formed, and a portion of the stem of the plant from which the genus, if not the species, may be determined. It grows to the height of 6 or 8 feet, and varies in the thickness of the stem from the size of a quill to that of the thumb. The leaf is serrated, of a dark-green color above, silvery-white below, not hairy or stinging, and has a reddish pedicel of about 3 inches long. The seed forms in small currant-like clusters along the top of the plant, and on alternate sides about an inch apart : two small leaves spring from the stem at the centre of and above each cluster of seed.

Habitat.—The *Pooah* is not cultivated, but grows wild and abundantly in the valleys throughout the mountains of eastern Nipal and Sikim ; at the foot of the hills skirting the Tarai to the elevation of 1,000 or 1200 feet, and within the mountains up to 3,000 feet. It flourishes best in the hills at the same elevation to which the cotton is grown ; but it does not, so far as I can learn, grow on the flat Tarai or open plain along the mountains. It is considered a hill plant, and not suited to the plains or found in them. It does not grow in the forest, but is chiefly found in open clear places : and in some situations, overruns the abandoned fields of the hill people within the elevations which suit it. It is, I believe, a perennial ; but of this I cannot speak positively, as I have not till now known the plant. It sheds its leaves in the winter, throws them out in April and May, and flowers and seeds in August and September. The exact period altering of necessity with the elevation.

When used.—It is cut down for use when the seed is formed. This is the case with the common flax in Europe. At this time the bark is most easily removed, and the produce is best. After the seed is ripe it is not fit for use, at least it is deteriorated.

How prepared.—As soon as the plant is cut, the bark or skin is removed. This is very easily done. It is then dried in the sun for a few days: when quite dry, it is boiled with wood-ashes for 4 or 5 hours; when cold, it is beaten with a mallet on a flat stone, until it becomes rather pulpy, and all the woody portion of the bark has disappeared; then it is well washed in pure spring water and spread out to dry. After exposure for a day or two to a bright sun it is ready for use. When the finest description of hemp is wanted, the stuff after being boiled and beaten, is daubed over with wet clay and spread out to dry. When thoroughly dry, the clay is rubbed and beaten out, when the hemp is ready for spinning into thread, which is done with the common distaff.

Uses.—The *Pooah* is principally used for fishing nets, for which it is admirably adapted on account of its great strength of fibre and its extraordinary power of long resisting the effects of water. It is also used for making game-bags, twine and ropes. It is considered well adapted for making cloth, but is not much used in this way. I have the pleasure to forward the following specimens in elucidation of this note.

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|--------------------------|-----------------------|
| 1. Leaves of the plant. | 4. The dried bark. |
| 2. Seed clusters. | 5. The prepared hemp. |
| 3. Portions of the stem. | 6. Thread. |

Darjeeling : September 24th, 1847.

A. CAMPBELL.

P. S.—The gigantic-stinging nettle of the Nipal and Sikim Hills is made into hemp, and used in making the cloth called *Bangra*,* the preparation is the same as the *Pooah*.

* See Notes on the Agriculture of Nipal, Vol. iv. p. 173, Transactions of the Agricultural Society of India.

The *Bangra* is harder and stiffer than the *Pooah*, and not adapted to making cordage and nets.

In compliance with your request I have forwarded to your address a packet of the *Pooah* hemp, which will, I hope, enable you to have the experiment instituted as to its comparative merits. I have also sent you a parcel of the dried bark of the *Pooah*, with which you may perhaps desire to try some other mode of preparation than that in use here.

Enclosed is a note from Serjeant Crutcher on the expense of preparing the hemp, which shows that the process in his hands has been very expensive. He tells me however, that he thinks it may be prepared for about 4 Rs. per maund, if done on a large scale: this of course is still conjectural. The point to be first ascertained is, the quality of the article. On this I hope again to learn the opinion of the Society.

Darjeeling; October 30th, 1847.

A. CAMPBELL.

Sir,—I beg to enclose an account of the expence incurred by me in manufacturing a small quantity of the *Pooah* for the Society.

I send per bearer the *Pooah* manufactured, also a seer in the rough state, for them to try experiments on.

The expence is, including the seer not manufactured, Rs. 4-6-6.

October 29th; 1847.

C. M. CRUTCHER, *Serjeant.*

Expence of manufacturing the *Pooah*, 4½ seers only, cleaned from the stalk, cost 11 ans. per

seer,	3	1	6
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Expence of boiling the above, 2 men for two days, at 2 ans. 6 pic each per diem, also finishing the process,	0	10	0
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Total,	Rs.	3	11	6
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Quantity manufactured from the above is two seers, at a cost as above detailed of Rs. 1-13-9 per seer: the waste in manufacture is exactly $\frac{5}{9}$ ths.

The reason this experiment is costly is this—the *Pooah* was brought in by a cooly engaged on purpose, and not cultivated by myself, also the process should be conducted on a large scale, as the same expence incurred as above would be sufficient for a maund.

Extract of a letter from Major JENKINS, dated Gowhatti, 24th November, 1847.

The *Oodal* rope I sent you not long ago was a presentation from Capt. E. F. Smith, Commanding at Sudiya; he thought it possible serviceable ropes might be made from this substance if better prepared. You may be aware it is the common rope used by all the elephant hunters when in the jungles. The tree is very common, and the rope is made most readily, the bark, or rather all the layers, can be stripped off from the bottom to the top of the tree with the greatest facility, and fine pliable ropes may be made from the inner layers of bark, whilst the outer yield coarse ropes. The rope is very strong, and very lasting, wet doing it little injury.

Report on the above-mentioned fibre and rope. By Capt. A. THOMPSON.

An unexpected pressure of affairs has prevented me till now sending you the specimens of *Oodal* rope and *Pooah* hemp you sent me to experiment upon. I have now the pleasure of handing you the manufactured specimens, as also returning the communications of Doctor Campbell and Major

Jenkins on the subject, together with some remarks on their value and the uses to which I think them adapted.

First, the Oodal. When well made, this rope is equal in strength to our best coir. But in its present state (from having been made green, I suppose) it is too stiff and inflexible for marine purposes. It resisted every attempt to separate the fibre or to dress it by hackling, and could only be useful I think for rafting timbers, bale-lashings, stage ropes, and such like purposes, for which jute is now used, and the value of which is from $2\frac{1}{2}$ to 3 Rupees per maund. You will see by the specimen that has been re-manufactured, that the same rope when laid by machinery is three-quarters of an inch less in circumference than that sent by Major Jenkins, consequently, a rope of 3 inches made by machinery is equal to one of 4 inches made by hand. I would further observe, that could the fibre be brought here in such a state of flexibility as to allow of its being dressed by the hackle and properly spun, the value would be very much enhanced, and I have no doubt could be made into good rope for ship use. The line made of the bark of the *Oodal*, you will observe, is much more flexible and better adapted for ship use, but not so strong. It is very elastic, having stretched 16 inches in 6 feet. It sustained $1\frac{1}{2}$ cwt. for 2 hours before it broke.

Of the *Pooah* I have to report more favorably. The substance resembles cotton-wool more than hemp, consequently better adapted in my opinion for sail cloth, twine, and thread than for rope. I send a specimen of the cloth made of it, as also a piece of line. The *Pooah*, when properly dressed, is, I think, quite equal to the best Europe flax, and will produce better sail cloth than any other substance I have seen in India. I observe from Doctor Campbell's communication on this fibre, that *mud* is used in the preparation, which clogs it too much, and not only renders it difficult to dress and spin, but spoils the color, as is evident by the sample of cloth made of it. My Superintendent Mr. Wil-

liam Rownee, who understands the nature of these substances, tells me, that if potash was used in the preparation (which is invariably done with Russian hemp and flax) instead of clay or mud, that the color would be improved, the substance rendered easy to dress, and not liable to so much waste in manufacturing.

The value of the *Pooah* fibre here may be estimated from the following data. To make one yard of sail cloth it requires 1 lb. 2 oz. of fibre, and the expence of dressing, spinning, and weaving it (with the rude apparatus now used by the natives), is 2 annas 6 pie, and I estimate the value of the cloth when made, at 6 to 7 annas per yard; or it may be easier understood, *thus*;—a maund of clean *Pooah* will give 72 yards, Rs. 25

Less expence of manufacturing, say, .. 10

Leaving as the value of the fibre, .. Rs. 15

There are other incidental expenses that are not included here, but as near as I can at present estimate, I should say, it is worth twelve Rupees per maund. I would only further observe, that if properly prepared and dressed, I think the *Pooah* capable of being converted into fibres much finer than either sail cloth or sewing twine.

Allow me also to hand you three specimens of hemp and rope made of them that I had brought from the west side of India, grown at the places named on the labels.* These have been tested both at the Arsenal and Government Dockyards, and proved perfectly equal to any and all purposes that cordage made of Russian hemp has hitherto been used for. From the encouraging reports upon this cordage from the heads of both the Naval and Military Departments, there

* Calicut, Ghote and the Concan. This hemp is no new discovery; I saw it in England, which led me to try it here.—A. T.

seems no reason to doubt that this hemp and others that are being daily discovered, will completely supersede the importation of Europe made cordage.

Having completed a manufactory for the improvement of cordage by patent machinery, and now anxious to turn my attention to the manufacture of sail cloth, twine, &c. I shall be at all times most happy to manufacture any samples that may be sent you, and which you may think worthy of a trial.

Calcutta : 31st December, 1847.

Note on various Indigo-giving Plants.

[A subscriber to the Agricultural and Horticultural Society, having indulged the writer who does himself the pleasure to address its Honorary Secretary, with the perusal of some of the late numbers of the Agricultural and Horticultural Journal, the subject of new indigoferous plants attracted his notice, and has induced him to venture the accompanying communication to the Honorary Secretary. Viewing the present condition of the Indigo trade, and indeed, its prospective welfare, it may not be deemed irrelevant to express an opinion, that the culture of other indigoferous shrubs in conjunction with the plant in use might prove advantageous to the planter, who has to struggle, not merely against a temporary reduction of price, but, it would seem, that a progressive tendency to cheapness in regard to indigo, as well as other natural productions, has become the general rule of commerce. The writer begs to subscribe himself a non-subscriber, but, well-wisher to the Agricultural and Horticultural Society.]

Mr. J. W. Masters, in his "Memoir of the natural productions of Upper Assam," Journ. p. 1, Vol. vi. adverts to *Marsdenia tinctoria*, (Brown,) or, *Asclepias tinctoria*, (Roxburgh,) as an interesting indigoferous plant.* Dr. Bancroft, in his

* The plant is also found in the jungles of the Tenasserim Coast. See remarks by Mr. O'Riley, Journal, Vol. iii. p. 231.--Eds.

“Philosophy of permanent colors,” Ed. 1813, Vol. 1, pp. 169, 189, says: “There is moreover, a plant belonging to a very different class, first mentioned as producing indigo, I believe, by Mr. Marsden in his History of Sumatra, p. 78, under the name of *Taroom akkar*. He describes it “as a vine, or creeping plant, with leaves 4 or 5 inches long; in shape like those of a laurel, but finer, and of a dark-green color,” and that, “by reason of the largeness of the foliage, it yields a greater proportion of sediment. The *Taroom* is always found in the plantations of the natives, but to dye with it, they leave the stalks and branches for some days in water to soak, then boil it, and with their hands work some chunam among it, with the leaves of the *Pacoo sabba*, (a species of fern,) for fixing the color. They then drain it off, and use it in a liquid state.” This plant, (*Taroom*) Dr. Roxburgh considers as a species of *Asclepias*, or *Swallow-wort*, and has added to it the trivial or specific name of ‘*tinctoria*.’ It was brought from Sumatra, and widely distributed in Bengal about the year 1791: is perennial, and is easily propagated by layers, slips, or cuttings.—Note. Dr. Roxburgh has favored me with three samples of indigo which he obtained from the *Asclepias tinctoria*, by hot water: one is a very fine violet-colored indigo; another is more inclined to blue, and the third to purple; the two last were specifically a little heavier than the first.” Further, p. 274—276, “my belief (is) that the *Baraset verte*, (or green indigo) of Mr. Birch, was obtained from the *Taroom akkar* of Mr. Marsden, the *Asclepias tinctoria* of Dr. Roxburgh, (who) describes another species of *Swallow-wort* under the name of *Asclepias tingens*, which is, he says, “a large, twining, shrubby plant, brought from Pegu in 1795, to the Botanic Garden at Calcutta, where it thrives well. Dr. Buchanan, who brought the plant, informed me, that from its leaves the Burmah people prepare a green dye. I have made (Dr. R. adds,) a variety of experiments, with the view of obtaining the green dye above-mentioned.

but without success.”—See Trans. of the Society of Arts. 28, p. 305.”

With regard to the latter plant, it is scarcely presumable that we are ignorant, at the present day, of any simple, vegetable green dye, known to the Burmese. May not the *Asclepias tingens*, Roxb., afford a yellow for the formation of green, in the way described by Major Hannay, Journ. p. 1. Vol. vi. in his “Note on the dye-stuffs of Upper Assam,” where, preparations of two plants, named *Mishmee teeta* and *Khue khew*, are severally superadded to blue for that purpose? Bancroft, however, Vol. 1. pp. 190, 264, says: “Professor Thomas Martyn, mentions on the respectable authority of Loureiro, that the *Spilanthus tinctoria* is cultivated in China and Cochin China; that the leaves bruised yield a most excellent blue color, and a green prepared by a method more easy than from indigo, and not inferior in brightness.” Loureiro mentions (tom. 1, p. 25 of the original Lisbon ed.) the *Justicia tinctoria* as growing wild in Cochin China, adding, ‘*folia viridi colore saturata, eodem telas pulchrè imbuunt.*’

While on the subject I beg to mention, (as it may not be generally known,) that the *pukkah* wood of the jack fruit tree (*Artocarpus integrifolia*,) yields a yellow color: a few experiments on which wood lead me to believe, that if brought into use, it would stand high in the list of yellow dye stuffs. It appears to be rich in coloring matter; affording also much of that “lively greenish or lemon hue, for which the Weld yellows are particularly valued,” according to Bancroft. A decoction of the jack wood requires no mordant to fix a common yellow on wool.

November 15th, 1847.

Remarks on the propagation of Plants by Leaves. Communicated by H. REHLING, Esq.

My attention having been drawn by Mr. Cheek's notice on the propagation of plants by leaves, and an extract from the *Gardener's Chronicle* for 1845, published in the *Society's Journal*, Vol. v. part iv., I beg to submit the following remarks of what I have perused from several German and Danish writers on this interesting subject.

Many have heard, and noticed the circumstance of propagating plants and trees by leaves, but it appears very few are aware of the real facts of the case. An intelligent gardener in Germany, by name Heinrich, was, if I am not mistaken, the first person who made the experiment; but Mr. Mirandola* is the first person who has written on the subject, and all that Mr. Hohlberg, and latterly Mr. Thümming and other writers have written on the same subject, is entirely borrowed from the above authority. To the great German agriculturist and economist, Von Mürchousen, is undoubtedly the whole credit due, of having been the person who has set this question at rest, and furnished us with real proofs with regard to this interesting subject. His grandfather planted in the year 1714 a leaf of a lemon tree (*Limon à Revo*), and observed that it had during the same summer struck roots, but without forming any buds; the ensuing spring he removed it into another pot, only allowing the roots to be covered up by the soil; very soon a bud was formed, but the stem was checked in its growth by the formation of a flower-bud, which the same season produced a fruit of a pretty good size. The

* The same authority is quoted in the extract from the *Gardener's Chronicle* for 1845, published in the *Society's Journal*, Vol. v. part iv. There is evidently a mistake in the extract, which calls him "Maudirola."

grandson Otto Von Mürchousen, and his worthy Secretary Mr. Jakaby, have since succeeded in rearing a number of trees on the same plan, which attained the height of 8 feet; and who, by a number of experiments discovered, that without exception, they failed in producing buds on other leaves than those of a lemon tree, and that only by paying attention to the following precautions in choosing the leaf; the leaf must be the produce of the same spring, and be healthy and full grown when detached from the branch, and particular attention must be paid that not the least sign to an eye or bud is perceptible at the angle formed by the stalk of the leaf and the branch, in which case the leaf is perfectly useless for propagation. If a leaf of the above description is obtained, it is put into a flower pot, and a slow heat and a continual and even moisture supported. When due attention is paid to the above, you may be sure of success.*

Mr. Esaias Fecisher, an eminent Danish naturalist, and who has written a good deal on the physiology of plants, has endeavoured to settle this question, and explain the cause that produces such irregular effects in a leaf. I will, as near as possible, give his own words: "Let us particularly notice and examine into the mechanism and functions of the leaves, and the work they are intended to perform, namely, to absorb, digest, and prepare food to support other parts of the plant. It is a well known fact, that trees generally put forth two shoots during the season; when the first shoot has been produced by the agency of

* Agricola has noticed the successful experiments made by Von Mürchousen in his "Versuch der Universal, Versuchung aller Baume, &c." but he has sadly prejudiced the cause he has adopted by the publication of some plates illustrative of the subject, and his statements abound in improbabilities.

“the organizable matter, prepared and reserved from the
 “previous year, the preparation of fresh organizable matter
 “for the production of the second shoot takes place. We
 “must here particularly notice the circumstance, that no eye
 “or bud is to be found on a lemon tree about this time, and
 “the organizable matter is consequently reserved in the leaf
 “itself, as if in store, till the supply is sufficient to form
 “cellular matter for the production of buds, which at once
 “burst out into leaves and branches. It is then evident,
 “that the cause is to be traced to the circumstance, that
 “the leaf contains in itself the necessary organizable matter
 “that engenders cellular substance for the production of
 “buds and leaves, without the agency of the other parts of
 “the tree, which, in other trees than that of a lemon tree,
 “is *gradually* supplied from the leaves, for the formation of
 “buds, and they do not therefore contain the necessary or-
 “ganizable matter, for, as soon as a bud is formed, the
 “leaf is exhausted, and has not the power to produce another
 “bud.”

On perusing the above remarks, the idea suggested itself to me whether leaves of other trees could not be prepared for the purpose of propagation, by adopting some means to prevent the eye or bud making its appearance, which, I should say, can easily be effected by operating upon the leaf and branch to which the leaf is attached, by which process the petiole of the leaf is charged with the necessary organizable fluids, and contains within itself, as the germ in a seed, the matter that ultimately produces a bud. Is it not probable, that this circumstance will account for some persons having succeeded in forming buds on leaves, while others, with all the attention and perseverance they have bestowed

upon it, have failed in doing? Is there not some likelihood, that in those instances which have been attended with success, the leaves selected have been deformed or injured by insects or other causes, in the first stage of their formation and growth? I am about making some experiments, and shall not fail to report the result to you. I think the subject well worthy the attention of parties who have more leisure and opportunity in making such experiments.

August 25th, 1847.

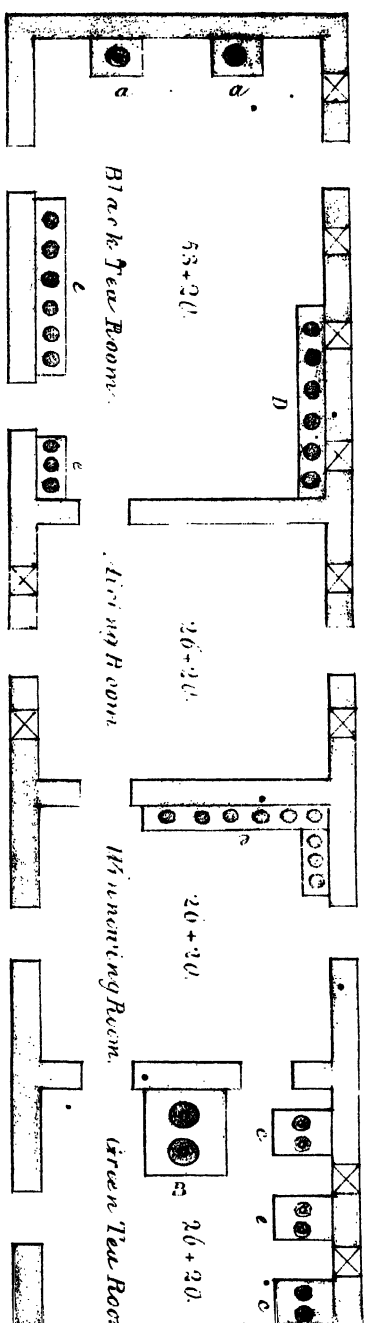




2 *Thea bohea*.



3



No 5 Tea Manufacturing Implements

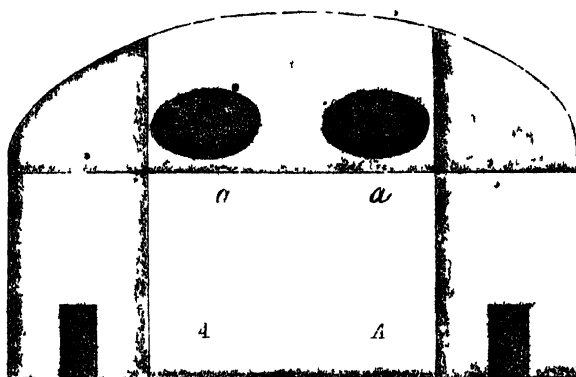


Fig 14

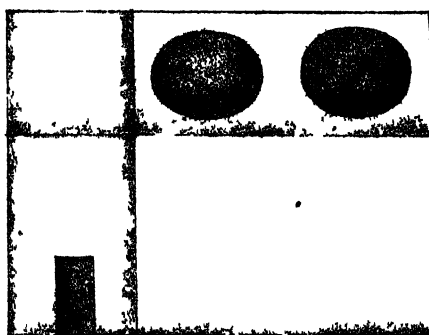


Fig 4



Fig 13



Fig 1



Fig 6

Nº 6. Tea-Manufacturing implements.

Fig: 45

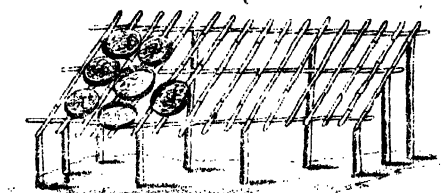


Fig: 16

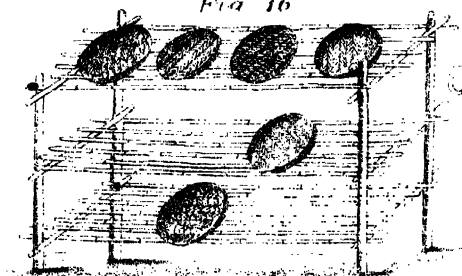


Fig: 2

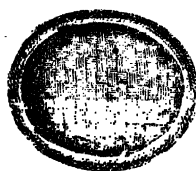


Fig: 8

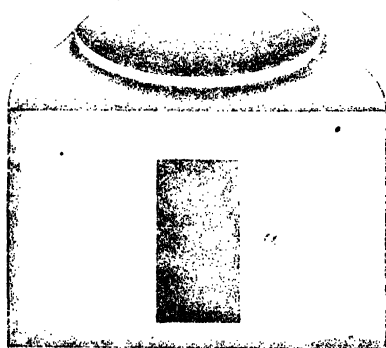
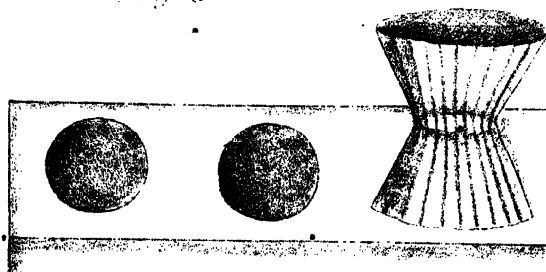


Fig: 3



177 The Manufacturing implements

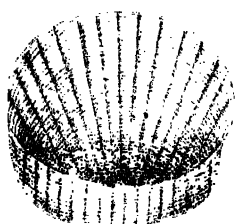


Fig. 1.

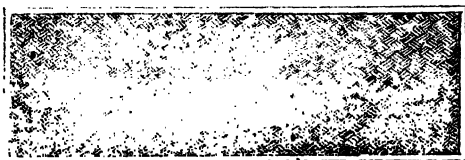


Fig. 3.

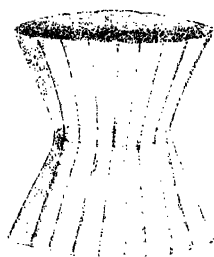


Fig. 4.



Fig. 5.



Fig. 6.



Fig. 7.



Fig. 8.



Fig. 9.

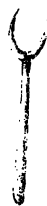


Fig. 10.

Fig. 22.

Winnowing Machine.
(Transverse Section)

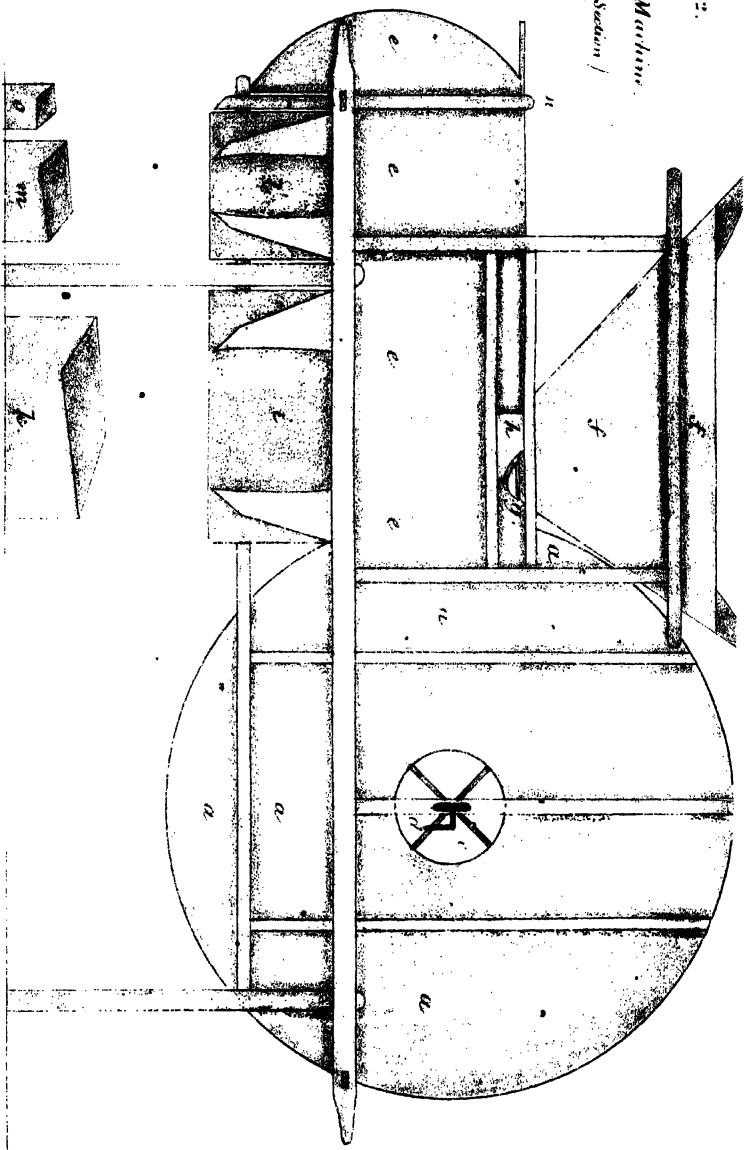
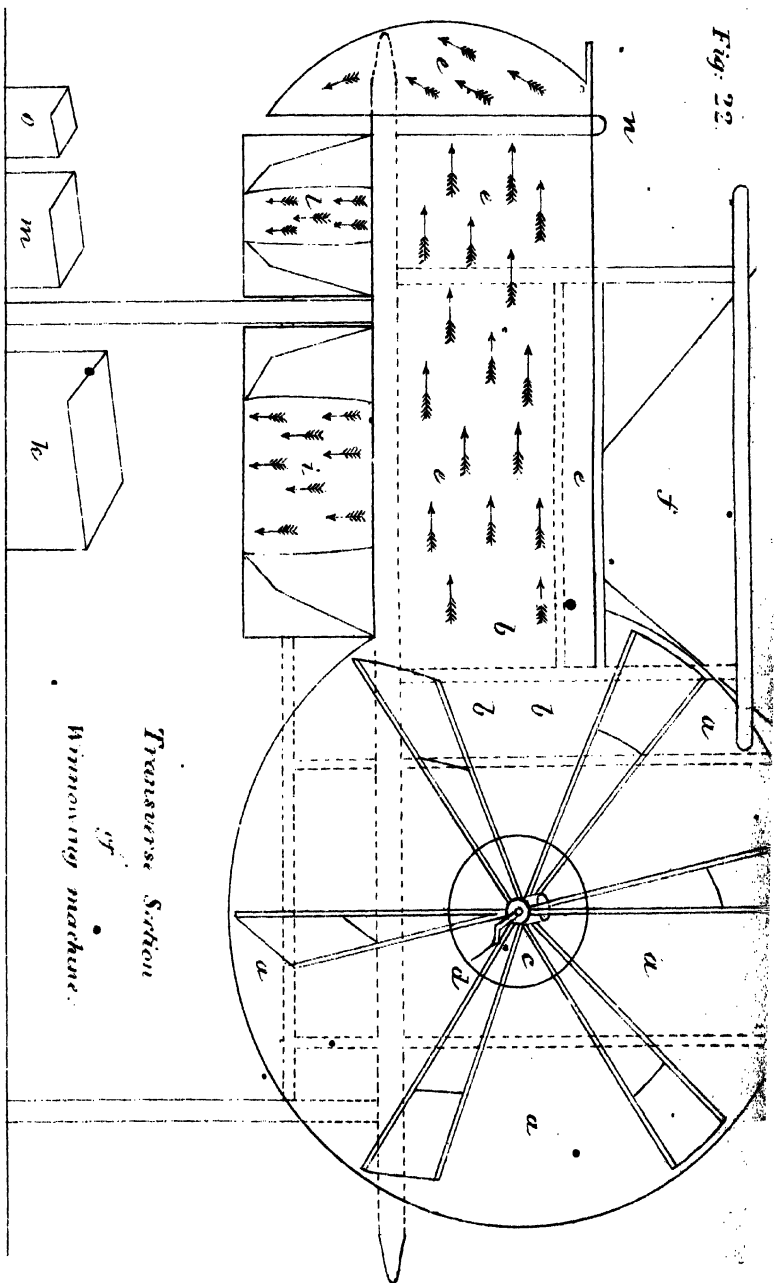


Fig. 22.



THE JOURNAL

OF THE

Agricultural & Horticultural Society

OF

INDIA.

Memorandum descriptive of several kinds of Cotton introduced into the Agra district. By H. HAMILTON BELL, Esq., Agent Cotton Experiments in the N. W. Provinces.

[Communicated by the Government of India.]

FOR transmitting a list of the various descriptions of cotton now in cultivation, under sanction and instructions of the Government, it may not be thought irrelevant or misplaced to accompany this with some short account of each separate kind, as explanatory of the mode of proceeding adopted, showing its results, and thus perhaps leading to suggestions that may render our future progress greater and more decidedly beneficial.

I have already in former papers noticed my decided preference for indigenous seed as the basis at least of all my arrangements, and besides the kinds of which musters were sent home in the early part of the year, the report on which is not unfavorable, and of which subsequent shipments were

composed, have met with some other descriptions, which I think deserving of attention. Amongst these are—

1. *Sophur*.—Of which the seed was obtained from a place so named on the confines of the Gwalior territory, near to Kolah. I accidentally heard 'it mentioned as superior, and immediately sent off a servant in whom I could confide, to bring me a bullock-load of the *kupas*, that I might learn whether the cotton merited its reputation, and to be sure of the seed as extracted by my own servants. In my opinion, it is superior to the *Bagchenee*, and it is in every other respect perfectly suited for cultivation in these provinces. It is perfectly hardy, comes quickly to maturity, and is fully as productive: it has attracted greatly the attention of the cultivators, and its introduction into these provinces will be facile and general. In several very carefully conducted experiments, I have ascertained that the *kupas* yields the very large proportion of $35\frac{1}{2}$ per cent. of clean cotton. Our cultivation is on too small a scale to justify any statement of average production, but at all events, it is in this respect fully equal or rather superior to the *dessee* cotton of the Doah. This year we shall have some bales of this quality for shipment, and plenty next year.

2. *Hybrid*, I conjecture, of *Bagchenee* and *Chundehree* cotton. I have not myself any doubt on this point. I know nothing of botany, and to accident, not science, am indebted for this description. I think very well of it. It has all the good qualities of the *Sophur* as to hardiness and production, and almost equals it in the relative proportion of cotton and seed. The cleaned cotton being $34\frac{1}{4}$ per cent. of the *kupas*.

3. *Produce of Coimbatore seed*.—Remarking in the newspapers that some cotton from thence had been sold at 7*d.* per lb in England, I obtained through a kind friend at Madras some of the seed. From the appearance of the plant I should consider it "New Orleans," but there is a marked

difference in the shape of the seed. It will hardly succeed in these districts; and although I think I may have influence enough to induce a variety of trials the ensuing season, I cannot hope it will answer, from the degree of irrigation it demands, its comparative limited produce, and the diminished relative proportion of cotton in the *kupas*: the mean of several trials varying but little, being only $25\frac{3}{4}$ per cent. Its fineness, and I think staple, are however, so attractive, that I will not give it up until I am satisfied success with it is hopeless.

4. *Hybrid of Bombay and Bagchenec.*—This very closely resembles the presumed hybrid noticed as No. 2, and the only reason I have for believing that there must be a difference is, that the flower in the former is white and in the latter yellow. I do not know whether this is botanically conclusive of a difference of species;—and in other respects, as regards production, proportion of cotton to seed, &c., they agree. I should add, that I believe I may say in every cotton-field of my own cultivation, there are some plants which are white in the color of their flower, and that the cotton invariably from these plants, so far as my observation goes, is superior to the perfectly similar plants contiguous with a yellow blossom. I propose to extend the cultivation of this description as much as practicable.

5. *Bombay.*—I describe this under this name: the seed reaching me by dâk, the address being in the hand-writing of a gentleman then residing at that place, but it has almost perfect resemblance to the *Chundehree* cotton. It is fine, but it will never answer here, from the extreme tardiness of its arrival at maturity; and although the plant is exuberantly productive of cotton bolls, these are small, and the relative proportion of cotton and seed are discouraging; the former giving in my trials only 25 per cent. of the *kupas*.

6. Of all I have introduced, this, the Jeypore, has attracted most regard. It is by far the most productive; the plants

being large, and covered with bolls larger a good deal than the *Sophur* or *Bagchenee*, and double those of the *desee* cotton. The cotton seems to have a longer staple than the other descriptions; but it appears to be almost as harsh to the feel as the *desee*. In this field there are a good many plants with a white flower, the general color being yellow, and these are decidedly the best cotton. I have about two maunds of the *kupas* of the white-flowered Jeypore, and I hope for two more, which will give me seed for 150 beegahs next season. The mean relation of cotton to *kupas* is $38\frac{3}{4}$ per cent., but some trials gave me above 40 per cent. Of this I send a sample, that my opinion of its preferable quality may be tested in the home market. I am indebted to Major Ludlow, Resident at Jeypore, for the seed of this cotton, which I regard as of the highest promise.

7. Although a variety of villages cultivate the *Bagchenee* cotton, thus named I fancy from the chief village in that part of the pergunnah where it is grown, the produce of Nundpore, Bindwas, Debee, and Deogun, has the highest reputation. This probably arises from the deep black soil there prevailing, but it is partially attributed to the careful selection of seed for cultivation. The women in seeding the cotton by the *churka*, are accustomed, whenever a large boll comes into their hand, to throw it aside into a basket placed for the purpose, and the same process is pursued when the basket's contents are freed from the seed. In this way the very finest bolls produce the seed, and they thus account for their superior cotton. That it is superior, is undeniable, for struck by the remarks, I sent at some expence a man to Nundpore to get some seed, and used it in my own cultivation. The produce is undoubtedly better than our other *Bagchenee*, which is fully equal to the general Gwalior description, so named, and its ratio of cotton to *kupas* is remarkable, being no less on my trials than 38 per cent. The produce even this year will be of sufficient quan-

tity to admit of being packed separately, and by that means we can obtain its accurate estimation in England. I have taken measures for a supply of seed for next year's cultivation from the villages in question, and from my own cultivation I can reckon on sufficient for some thousand beegahs.

8. This cotton, which I term *Omurgurh*, originally was the produce of a few plants in a *Khet*, sown with the *Chundehree* cotton. The shape of the leaf and general appearance of the plant led me to desire its being separately picked, and the seed set aside for the ensuing year, whilst the produce of the *Chundehree* seed generally came so late to maturity as to be continually exposed to frost, and was also otherwise unsuitable: this flowered early, and was fairly productive and fine, and fully justified the trouble taken with it. The natives will now readily use the seed in their sowings. The cotton is $33\frac{1}{3}$ per cent. of the *kupas*.

9. Seed of white flower. Jeypore cotton.

10. I trust it will be considered that these musters establish some progress, and although I fear it will take more time than I had anticipated to give us a fair prospect of success in a struggle partially for the home market, I see nothing to discourage the expectation that ultimately we shall effect such an improvement in the cotton of this country, as will render it suited for many of the manufactures of Great Britain. I do not look much further than this just now, let us once secure a certain regular market at some price, let us get our cotton into use, and the rest will follow.

*Correspondence regarding the cultivation of Wheat in India,
and the practicability of exporting it to the English Market.*

[Communicated by the Government, North-Western Provinces.]

To R. MONTGOMERY, Esq., Collector of Cawnpore.

SIR,—In compliance with your request, I beg to submit the result of my inquiries with reference to the memorandum of the Agra Revenue Department, transmitting to you copy of a despatch from the Honorable the Court of Directors regarding Dr. Royle's observations on the cultivation of wheat in India, and calling for information on the subject.

2nd. From the second paragraph of the Honorable the Court of Directors' despatch it would appear, that information is required on the following points, viz. :—

1. The quantity of wheat cultivated in the district.
2. Quality and varieties of the grain.
3. The ordinary bazar prices.
4. Cost of conveyance to Calcutta.

5. And generally on any points which may assist the Court of Directors in forming an opinion as to the possibility of making wheat an ordinary article of export from India to England, with reference to the usual average prices prevailing in England for that description of grain.

3rd. With reference to the first point I beg to remark, that from investigations which I made myself, while out in the district on circuit, in the years 1844 and 1845, and subsequent enquiries, I am of opinion, that the quantity of wheat cultivated in the district cannot be less than 161,461 acres, or Jurreebce beegahs 355,214, yielding at the average of $17\frac{3}{5}$ bushels per acre, 101,490 tons, or maunds 28,41,712, at the average produce of 8 maunds per Jurreebce beegah.

4th. In reply to the second query I have to state, that there are three varieties principally of the wheat cultivated in

this district, namely, two species of the white or *Triticum sativum*, called here the *Pissee* and *Doodeea*, the one bearded, and the other awnless. The third, the red kind, or *Triticum aristatum*, called here the *Gujjur*, is cultivated about the banks of the river Ganges, and *nuddies* subject to inundation during the periodical rains. The white wheats, on the contrary, are grown on the level plains or table-lands of the district.

5th. With respect to query the third I have to observe, that in an average season the white wheats generally sell here from 30 to 32 seers, (60 to 64lbs.) per rupee (2 shillings), and the red from 33 to 35 seers (66 to 70lbs.) per rupee.

6th. In reply to query fourth I have to state, that the expence to Calcutta does not exceed 8 annas (1 shilling) a maund or bushel, equal to four rupees (8 shillings) per quarter, consisting of 8 bushels, or 8 maunds.

7th. I shall now proceed to offer a few general remarks with respect to the concluding number of the Honorable the Court of Directors' despatch.

8th. There are other varieties of the red wheat, which are produced on the banks of the Ganges and *nuddies*, and brought here by water for sale from Anoopshire, in zillah Coel, and villages in Rohilcund and Shahjehanpore, situated on the banks of the Ganges.

9th. The *Pissee* and *Doodeea* are consumed by the better classes of natives, and used by the bakers for the manufacture of loaf-bread; the red is used by the middling classes of the people of the district.

10th. The white wheat purchased here at harvest time at 30 and 32 seers per rupee, would cost when landed in Calcutta about 1 rupee and 12 annas per maund, and in England about 35 shillings per quarter. In the 7th para. of page 6 of the report, which accompanied the despatch of the Honorable the Court of Directors, it is mentioned that the freight and other charges from Calcutta to England amounted

to 25 per cent., but through mistake, it will be perceived the whole 25 per cent. has been added to the cost of one quarter, or eight baskets, instead of 7 shillings the proportion chargeable upon the quarter. This error made the price of the wheat when landed in England amount to 53 instead of 35 shillings per quarter. From enquiries which I have made of the wholesale dealers, I find that from twenty to thirty thousand maunds of the white and red kinds of wheat, may, without difficulty, be purchased here about harvest time at the averages mentioned in my reply to the third query.

11th. The Patna and Monghier white wheats, which were very largely sent to Calcutta for export to England, are however, selling at the present moment in the Calcutta market so cheap, (about a rupee a maund,) owing to the unfortunate prevailing commercial pressure and disasters, that I am of opinion nothing could be advantageously done here until the present panic wholly subsides.

12th. I have the pleasure to submit musters of the several kinds of wheat which I procured here from wholesale dealers in the article about a month ago, with the prices affixed which each sort then bore in the market. Since that period the prices have risen somewhat, owing to the great concourse of people and cattle belonging to the King of Oude which remained encamped opposite to Cawnpore for about a fortnight. The consumption of grain of all kinds during that period was so large, that the whole of what was usually stored for the year's consumption of the inhabitants for miles and miles around, on the opposite banks of the Ganges, was used by the King of Oude's followers and cattle. In consequence, a temporary rise has taken place in the prices of grain, and a good deal of what is imported here by water from above is carried across into the Oude territories, to supply the deficiency thus occasioned.

13th. In page 9 of the report it is stated—"the grand point to decide was, can wheat be landed at Liverpool in a

sound state, that is, free from weevil, or not?" I am of opinion it may, by dipping the gunny bags which are to be used for the packing of it, into a solution of nitre, plunging them afterwards in cold water, and allowing the bags to dry properly before the grain is put in them. This process would cost little, as the saltpetre used could be again almost wholly extracted by simply boiling the saturated water and crystallization. It would be worth while trying the experiment, particularly as the expence would be trifling compared with the object in view.

I have, &c.,

CAWNPORE :
The 20th Dec. 1847.

(Signed) J. G. BRUCE,
Deputy Collector.

To the Sudder Board of Revenue, N. W. Provinces, Agra.

GENTLEMEN,—I have the honor to submit for the perusal of the Board a letter and its enclosures, No. 56, dated 12th instant, from the Collector of Goruckpore, on the subject of the wheat grown in that district.

2nd. Mr. Cook is a practical agriculturist, who manages a grant on the western side of the district. Mr. Nicholson is a Sub-Deputy Opium Agent, who exercises his vocation on the eastern side.

3rd. The instructions of the Court of Directors referred to by the Collector have not been received in this office.

4th. Mr. Cook's suggestions for packing of wheat in shipments, with the same precautions as are observed by the natives of the country in storing it, are, I doubt not, judicious. But I am inclined to concur with Mr. Nicholson, that the weevil is the real obstacle to successful exportation. Attempts have more than once been made, but they were total failures.

I have the honor to be, &c.,

(Signed) E. A. READE, *Commissioner.*

TO E. A. READE, ESQ., *Commissioner of 5th Division.*

SIR,—With reference to the Court of Directors' instructions, dated London, the 17th July last, I have the honor to transmit for your information copies of memorandums by Messrs. Cooke and Nicholson of this district, on the subject of wheat.

I have, &c.,

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(Signed)

H. CARRE TUCKER, *Collector.*

The 12th February, 1848.

TO H. C. TUCKER, ESQ., *Collector of Goruckpore.*

SIR,—I have received your Circular regarding wheat, and if the following remarks will prove acceptable, I shall be fully repaid for the time I have devoted to the subject.

In this part of Goruckpore (west), to my knowledge there are seven kinds of wheat grown, viz. :—

1st. *Tameeah*.—This does not grow tall: is a small grown, and is copper colored, hence its name: is very glutinous and is easily ground into flour, which is soft: is sown and grown in high lands: the return per acre in grain amounts to, in a fair returning season, 12 maunds Goruckpore weight, or 20 per cent. more by the Calcutta bazar standard, or 576 seers, equal to or a little better than 1,152lbs., which at 60lbs. to the bushel equals about 20 bushels per acre.

2nd. *Gungajullee*.—Grows taller than the preceding kind, the grain likewise is larger: color whitish: takes its name from the clearness or whiteness of the water of the Ganges: not so glutinous as No. 1: is easily ground into flour: has a small proportion of husk or bran: flour soft: is sown and grown in *Dorus* soils, i. e. neither light nor heavy: the return per acre in grain exceeds slightly No. 1, or say Goruckpore maunds 13-8-0, or 20 per cent. more by the Calcutta bazar standard, or about 21 bushels per acre.

3rd. *Setwa*.—Grows tall: grain larger than No. 2: color darker, likewise grows in low, heavy and moist lands, is a hard grain: less glutinous than Nos. 1 and 2: crop not easily

destroyed by wet or damp weather : has a greater proportion of husk than No. 2 : flour hard : the return per acre in grain exceeds the two former kinds, or say Goruckpore maunds 14-16-0, or 20 per cent. more by Calcutta bazar standard, or 23 bushels per acre.

4th. *Mooriliva*.—Grows better than all others : color darkish : grows in heavy soils : a large grain and hard : glutinous, husky, flour hard : ripens later than all other wheats : has no awn or beard, whence its name *Mooriliva*, i. e. shaven : returns per acre Goruckpore maunds 14-16-0, or bushels 23 per acre.

5th. *Daodee*.—Grows tall : color white : grows in *Dorus* soil : large grain : mealy : more glutinous than Nos. 3 and 4 : not very husky : flour soft : is called after King David of old : returns per acre Goruckpore maunds 14-16-0, or 23 bushels.

6th. *Lalleeah*.—Grows tall : color reddish : hence its name : grows in *Dorus* soils : is preferred to all other sorts by agriculturists : has not much husk or bran : soft, very glutinous and sweet : returns per acre Goruckpore maunds 14-16-0, or 23 bushels.

7th. *Samodiva*.—Grows tall : color whitish : grows in low or *muttiar* lands : grain large and hard, not so glutinous as No. 6 : rather husky : flour hard : returns per acre Goruckpore maunds 14-16-0, or 23 bushels.

The seed required to sow an acre of land with wheat is about $1\frac{1}{2}$ maund, or 72 seers Calcutta weight, or 5 qrs. 7lb. 12oz. It is a winter crop : is sown about the latter end of October or beginning of November, and requires two waterings to bring it to maturity, unless there is a fall or two of rain. Wheat is likewise very generally sown on the sloping banks of rivers : after the subsiding of the waters on such lands it requires no irrigation, and the returns are larger. The lands used for wheat are highly cultivated and pulverized, and are generally fallowed before a crop is put into them :

the same lands do not have a wheat crop two years running, but have a change.

In case, however, of the periodical rains continuing to a late period, much of the lands which have already produced a rice crop are sown likewise with wheat; wheat is reaped in March. The produce of wheat cultivation varies according to influence of soils. I would offer as an opinion, that nearly one-third of the whole lands under cultivation in Goruckpore are annually under wheat crops. Presuming that such opinion is nearly correct, then perhaps not less than Calcutta bazar maunds 7,660,000 of wheat are produced annually in this district, which is principally a grain district, and exports its produce to other places, viz., Benares, Agra, &c., in times of scarcity, through its own principal marts of Bansu, Gopalpore, Bhurruj, and Belwa, by water carriage.

Wheat sells in the district of Goruckpore, that is, buying from the farmer direct, at from 2 maunnies to 2½ maunnies, according to the greatness or scantiness of returns of the season, this equals about 34 seers to 42 seers Goruckpore weight, equal to about Calcutta bazar weight 41 to 51 seers per one rupee. If advances are made to the farmer on the returns of his crop in cash, 2, 3 or 4 months before harvest, 25 per cent. is generally taken and allowed above market ruling prices, when the new crops come into market.

The cost of conveyance from either of these marts to Calcutta is about 30 rupees per 100 maunds, Goruckpore weight, for boat hire, or say about 5 annas per maund if stored in bulk, a bad method; if in bags, the expence will be about one anna more per maund, insurance 3 per cent. *ad valorem*, and transit charges may come to one anna more, i. e. 7 annas per maund for boatage alone, which does not include inland charges for hackery hire from the granary to the shipping ghats: however, I think that even from Goruckpore, wheat can be landed in Calcutta, all charges paid, at from 1-8 to 1-12 per maund, Calcutta bazar weight.

Wheat will keep in good order any reasonable number of years even in India when properly packed and laid up; the method practised by the natives is, to stow the chaff or bhoosa a non-conductor of damp below, above, and all round their granaries inside, in the midst of this nest of chaff is placed the grain, slightly again intermixed with chaff; the principal object is to secure it against a damp atmosphere which ruins it, and is the cause of the weevil coming into life from the grain itself. This natural transmigration takes place by the action of a damp atmosphere working chemically on the different substances of which the grain-wheat is composed in a corrupted state.

I see no great difficulty or loss to be apprehended in a shipment of wheat to England, so far as damage to the grain is concerned, provided the cargo is shipped either in the cold or hot seasons, never during rainy or damp weather. It should then be either put up in large hogsheads, well secured and slightly intermixed with its own straw or chaff bhoosa; in such case the grain would be perfectly good even for sowing purposes. If such were not the desired object, but merely a large supply for food, then I presume that the grain should be made to pass quickly through a hot oven or over a sheet of well heated iron, so as to bear a slight scorching, such process would be sufficient to destroy all animal life, and keep the grain secure for all victualizing purposes in a colder and drier climate.

It has often occurred to me that India, as a great agricultural country, would have greatly benefited by encouragement of shipment of its bread-stuffs to England, and there is no doubt that means and methods would be found in abundance for the security of its grains against damp and weevils, if but a profitable market were open and upheld with encouragement in England. The early shipments of grain-wheat from this country, many years ago, were most likely made by adventurers, who paid but little attention to the in-

fluence of our Indian atmosphere on all vegetable matter: these things are better understood now, with the greater amount of mercantile ability now permitted to act in India.

I consider that a large supply of corn taken from India would very much enhance the interests of the landholders and farmers: it would tend to greater attention and improvement in agriculture and to the soil eventually. Land would become more valuable, whoever was the owner of it, whether the Company or the aborigines. Foreign money would flow into circulation in larger amount instead of going to America, France and all other European corn countries, and would thereby cause the Company's collectorates ever to be easily and readily replenished by *malgoozars*.

GORUCKPORE: I remain, &c.,
Bustee, 30th November, 1847. (Signed) W. COOKE.

Camp Hatta : 8th February, 1848.

TO H. C. TUCKER, ESQ.

MY DEAR SIR,—The accompanying, circulated I presume by you, reached me this morning.

My opinion is, that any attempt to ship wheat to England, such as is procurable in the eastern division of this zillah, would be attended with total loss.

The very last samples that I have seen since I have been in the district, are far inferior to what I have commonly seen near Mirzapore; Benares or Ghazcepoore. The grain here is poor, small, contains a large proportion of bran, and is besides peculiarly liable to attacks from weevils.

(Signed) R. NICHOLSON.

*Memorandum respecting Timber Trees and materials for Fuel.**By Dr. FALCONER.*

[The following memorandum was prepared by Dr. Falconer, at the request of the Society, in reply to the undermentioned queries of Capt. O'Brien, of the Nusseeree Battalion. Under the impression that the information contained therein may prove serviceable to others, the Committee of Papers have much pleasure in publishing it for general information.]

Queries.—For France and other European countries, where wood is used for fuel, what means are taken to keep up the forests? Are there any books on this subject, and where is the best information obtainable?

What quantity of ground would be required to produce a continual supply of fire-wood for about five thousand people?

What would be the best kind of tree to plant for fire-wood merely, and not for other purposes?

After how many years does the willows' pollard reproduce faggots thick enough to burn, and where is the best information regarding the pollarding of trees obtainable?

In France and Germany, more especially the latter country, the forests are carefully looked after, under an organized system of management, conducted by rangers and foresters under a general scientific direction. The forests are for the most part enclosed: the products of thinning and pruning, and the refuse after felling, are turned to a thrifty account: felling is placed under strict regulation, and care is taken that the trees cut down are replaced by others, produced by natural sowing or reared by artificial planting.

The same system has been partially tried in India, and attended with similar results. Indiscriminate felling, under no restraint, was allowed to the native wood merchants in the great teak forests belonging to the Government on the Malabar Coast, and no provision whatever was made for

the renewal of the trees cut down. The consequence was, that these forests became so utterly exhausted, that difficulties were met with in procuring a supply of suitable timber for gun-carriages for the Madras Presidency, and for the dock-yards at Bombay. During the same period, the conterminous forests of Travancore, belonging to a Native Rajah, were under forest management, conducted by a European Superintendent. Besides a regulated system of felling, care was taken that for every teak tree cut down ten young trees should be planted. The results have been, that the Travancore teak forests have continued in the full vigour of supply and renewal, while the Government forests have been exhausted. Similar instances of apprehended exhaustion have occurred elsewhere in India from unrestrained felling, with no provision for renewal.

The forest lands in Germany are estimated to amount to about one-third of the entire surface. They consist either of the State forests or of forests which are the common property of the villages, both being alike under the guardianship of the State. The general management in the different States is usually vested in a Board of Forest Commissioners: the country is divided into districts corresponding with the internal civil divisions, and, according to the extent of the forest tracts, rangers and foresters are appointed. Every tree is known, and destined to a specific duration: and when felled, it is replaced by fresh planting prescribed by regulation. From the necessity that the towns and villages removed from river communication lie under, of having fuel and timber for consumption, the forests are not exclusively confined to the mountainous and uncultivable land. Every village has its supply of wood for burning and building from common forests, the felling and planting of which are regulated by the district foresters. In many of the States, Professorships have been founded in the Universities, for the express purpose of scientific and practical instruction regard-

ing the growth and management of timber. These remarks are chiefly applicable to Prussia, Saxony, Bavaria and the States along the Rhine.

There are numerous English works on planting, and all the operations connected with it for scenic effect, and for the growth of trees for timber. Among these I may mention "Loudon's Encyclopedias," "Monteith's Foresters' Guide," "Nicol and Sangster's Planter's Calendar," &c. &c. There is also a great deal of information scattered through the articles in Loudon's "*Arboret. et Fruticet. Britannicum.*" But at present I know of no English work to which to refer Captain O'Brien for the kind of information he wants, on the statistics of wood fuel as applicable to Great Britain: the abundance of either coal or peat, throughout the United Kingdom, rendering wood an article of only partial or subordinate consumption as fuel. I am not aware of any statistical returns on record on the subject.

The most comprehensive French works on planting are Du Mont's "*Botaniste Cultivateur*," in 6 vols. 8vo.; and Baudrillart's *Traité General des Eaux et Forêts*, 5 vols. 4to. The German Literature in this department is very extensive, and, in consequence of the situation of the country and wants of the people, more exact and detailed than any other. There are numerous "*Baumzucht's*" or Guides to Arboriculture, and one or more "*Jahrbuchs*" devoted to forest management. The latest English information on the management of the German forests, to which I can refer Captain O'Brien, is contained in Banfield's "*Industry of the Rhine*," a small work published in 1846.

With regard to Capt. O'Brien's next query, as to the quantity of ground necessary to produce a continual supply of fire-wood for 5000 people, it is so indefinitely expressed, as hardly to be susceptible of a definite answer, as applicable to India. For the consumption must vary exceedingly with the climate, and consequently with the habits of the people.

In the plains of Hindostan, by much the greatest part of the fuel consumed is cow-dung: the consumption of fire-wood proper is comparatively small. Whereas in the hills, at elevations where the climate is temperate, and the winter long and severe, the consumption of fire-wood for cooking, and artificial temperature, must be very much greater. The consumption may be expected to increase in the ratio of the altitude.

Supposing a climate in this country corresponding in consequence of elevation with the western parts of Germany, and that the wants of the people were similar, we may approximate to an estimate: In the Rhenish Provinces of Prussia, the population is reckoned at about $2\frac{1}{2}$ millions of inhabitants, and the quantity of land under forest is estimated to amount to nearly 2 millions of English acres: the surface occupied by forest, being to the cultivated land, nearly in the proportion of 3 : 4. This would give .8 acre of forest land for all purposes of timber consumption and fuel, per inhabitant. In Baden, through the whole length of which the "Black Forest" stretches, the forest lands occupy about three-fifths of the entire surface of the Duchy: they amount to about 810,044 English acres. Estimating the population in Baden at 1,300,000 inhabitants, this would give about .625 English acre of wood consumption, per inhabitant. In Baden 70 per cent. of the wood annually felled is consumed *as fuel alone*. This will give .437 acre of forest land as the consumption for fire-wood by each inhabitant.

The best kinds of wood to rear merely for fuel, are the most rapid indigenous growers of the country. Such (in Europe for instance) as the pines, firs, larch, willow, poplar, &c. In Germany, "beech" is considered the most productive fuel timber, and is reared for fire-wood solely. Capt. O'Brien need not look beyond the native trees of the Himalaya at different elevations: for no introduced trees could furnish better materials. All that is wanted is conservancy

in regulating the felling and cutting, so as to prevent a tract from being cleared of wood, and suitable means being taken for the renewal of the trees cut down. .

At the elevations corresponding with Simla and Mussooree, such trees as *Rhododendron arboreum*, *Andromeda ovalifolia*, *Quercus incana*, *Pavia Indica*, (Himalayan horse chesnut) *Pinus excelsa*, *Populus ciliata*, and the arboreous forms of *Euonymus*, *Cornus*, *Benthamia*, the *Laurineæ*, *Carpinus*, *Ulmus*, &c., with species of *Acer*, furnish the most ample materials for native supplies of fuel.

My friend Capt. Vicary, of the 3rd European Infantry, now stationed at Subathoo, can supply Capt. O'Brien with excellent and accurate information on the spot, respecting the indigenous Himalayan trees here referred to. If an introduced species is requisite, beech is the best and most suitable.

Notes on certain species of Silk-worms indigenous to India.

By B. H. HODGSON, Esq. and R. W. G. FRITH, Esq.

I have the honor to forward herewith sample of the silk of the wild worm of the *saul* forest, with cocoon of the wild (large) and tame (small) silk-worm of the *saul* forest; also drawings of the moth, caterpillar, cocoon and chrysalis of these worms. The silk, wild and tame, appears interesting. The large worm (wild) feeds on the *saul* tree (*Shorea robusta*), the fibre yielded is very strong, and must surely be that known to classic commerce, and used by the Romans for the manufacture of the awnings of their immense theatres. This worm seems to be the *Deo Moonga* of Assam, but I am not sure. The drawings will, however, enable an entomologist to decide, for they are very accurate and of full size. The larger is the wild-worm, the smaller, the tame, and the latter is, I think, identical with the common castor-oil worm of Assam and elsewhere; but still it is interesting, as being reared in the *saul* forest so far west as the *Cosi*. I shall be

glad to hear what the Society think of the two species of silk-worm.

Darjeeving : 8th January, 1848.

B. H. HODGSON.

The drawings received by the Society from Mr. Hodgson, and handed to me for inspection, are undoubtedly (the larger one) that of the Tusseh silk-worm of India,* with moth and cocoon ; (the smaller one) that of the *Arrindy* or *Eriuf*† worm of Assam, and north-eastern parts of Bengal.

The former, Mr. Hodgson seems to think, is the *Deo Moonga* of Assam. But according to Mr. Hugon (see Journal of Asiatic Society, Vol. vi. part 1, page 32), the *Deo Moonga* is quite a different insect, and seems to be very rare in Assam, and is found only in the wild state. This is the *Kontkuri Moonga* of the Assamese, and *Gootee-poka* of Bengal.

The drawing represents the perfect insect, the caterpillar and cocoon, all of life-size. They are very fairly executed, but the artist has committed one great error : he has figured the female moth, and given to it the deeply pectinated antennæ of the male insect, otherwise they are correct enough.‡ The antennæ of the female of this moth are, as is usually the case, when this one sexual difference exists in the noctuidæ, but slightly pectinated and larger than those of the male, and indeed though the specimen be ever so fresh, appear as if the feathered part had been worn off.

As far as my acquaintance with this beautiful insect extends, I believe it to be found throughout the whole of this side of

* *Phalæna mylitta*, Drury, Exot. Insects, Vol. i., pl. 5, fig. 1 ; *Bombyx mylitta*, Encyc. Method. ; *Phalæna paphia*, Cam. Pap. Exot., pl. 146, fig. A., pl. 147, figs. A. B., pl. 148, fig. A.

† *Phalæna cynthia*, Drury, Exotic Ins., Vol. ii., pl. 6, fig. 2.

‡ I have thought it as well to introduce here just a portion of a drawing of the female moth, showing the antennæ as they should be. This drawing I have taken from one of my specimens from Kussowlee, purposely that Mr. Hodgson may see the color of it, as differing from the general rich yellow of the female.

India, that is to say, from the north-western range of the Himalaya direct south as far as Midnapore, and also through the north-eastern range to Assam and southwards to Chittagong. I have no doubt but that it extends further, but cannot state so from my own experience. Dr. Royle, in his volume on the productive resources of India, states that it was found by Colonel Sykes in the Bombay, and by Dr. Geddes in the Madras Presidency.

I have seen it from Mussooree, and have it in my own collection from Kussowlce, Darjeeling, Assam, Cheera Poonjee, Sylhet, Chittagong, from Chota Nagpore, and from several of the districts of Bengal. In Bengal I have taken the larva at all seasons of the year, excepting during the cold weather, when the trees constituting its food are leafless.

It is most abundant, I am informed, in the Bhaugulpore district, when the cocoons in their proper season are collected by hackery-loads for the manufacture of the *Bhaugulpore* or *Tusseh silk*, as it is called, and now so well known. A tolerably correct description of this moth is given in the 7th volume of the Naturalists' Library, (Entomology) page 146. The illustration of it at plate 14, fig. 2, which by the bye is that of the male insect, is furnished with antennæ of the female insect, the very opposite error to that made in the drawing sent down by Mr. Hodgson. Plate 15 of the same volume, figs. 2 and 3, are the larva and pedunculated cocoon of the same, but they are very bad figures. In the above volume it is stated,—“when these caterpillars approach near their full size, they are too heavy to crawl in search of their food back up, as is usual with most caterpillars, but traverse the branches suspended by the feet, see plate 15, fig. 2.” The writer here, it appears to me, has decidedly brought forward an erroneous idea with the view of pointing out the unwieldy size the creature attains, and which is more correctly and sufficiently shown by the measurement given of it. It is not on account of the great size of the larva that

it is obliged to take to the under side of the twigs to enable it to traverse them in search of food, for it can pass along them in any *position* when they are *strong* and *thick* enough for its powerfully clenching feet to find sufficient to grip hold of. It is clear when the larva approaches the ends of the thinner branches and twigs, (which it frequently does, having taken it on some so slight, that it has been in perfectly pendant position,) it would be impossible for it to travel with ease to itself in such position as to keep itself *upwards*: it therefore prefers taking the *under* side of the twig, and passes along it in a suspended position, with the aid of its powerful feet, for it takes some little trouble to make them release their hold when once firmly fixed.

I have known the perfect insect make its appearance out of the cocoon in the rainy season in about 20 days. A great deal depends however upon the temperature and state of the atmosphere, as to the number of days that are required, ere the moth makes its exit from the pupa state.

The food of the caterpillar seems to be confined to the leaves of but a few trees: I found it only upon the *bûir* (*Zizyphus jujuba*), both wild and cultivated kinds, and on the *badaam* or country almond (*Terminalia catappa*). Mr. Hugon states, that it feeds in Assam, not only on the *moon-ga* trees, but also on the former of those mentioned above, and on the *Semal* (*Bombax heptaphyllum*). Dr. Helfer describes it as being taken upon and from other trees, and these are transplanted on to the *Assun* (*Terminalia alata*), but that they feed most commonly in the wild state on the *bair* tree (*Z. jujuba* and *Bombax heptaphyllum*). Mr. Hodgson again has discovered that its food is the *saul* tree (*Shorea robusta*), which is interesting.*

Dr. Helfer, at page 43, Vol. vi. part 1, for 1837, of the Journal of the Asiatic Society, states, that according to

* Since writing this I have been informed by a friend, that in the Midnapore district the caterpillar feeds upon the *saul* also.

Michael Atkinson of Jungypore, this species cannot be domesticated, because the moths take flight before the females are fecundated. Dr. Helfer's opinion does not bear out the truth of this remark, and I agree with him as he further states in continuation, that having kept them in a musquito curtain to prevent their escape, they were readily impregnated by the males, and deposited thousands of eggs. The moths no doubt, both male and female, will fly away if not confined in any manner to prevent them, particularly the males, for the sole purpose of seeking the females. I am of opinion, that this silk-worm might be reared and domesticated with very little care and attention. A female for instance, produced from the cocoon and retained captive, can, as above stated, be readily impregnated by the males, which are so eager for the intercourse, that I have at times taken as many as from 10 to 15 individuals in the course of a couple of hours, between the hours of 2 o'clock and 4 in the morning, and that for three or four nights in succession, with the aid of the same decoy female. The moths, both male and female, live for about 10 days, if they are not allowed to approach each other for the purpose of reproducing their species, and this without food of any kind, seeing that they are not provided by nature with a mouth. The following (which reached me after I had penned the foregoing remarks) is a description of the mode adopted at Bogrec, in the Midnapore district, for rearing this worm in a state of confinement, and for which I am indebted to Mr. Charles Blechynden, Superintendent of the Radnagore silk filatures :—

“Cocoons for seed are purchased in the month of *Pous* (December) and *Maugh* (January) at 15 or 16 *gundahs* per rupee: they are hung in a pot for four months, or till about the 13th *Bysack* (April), when some of the moths come out of the cocoon and are removed into another pot, and kept there for a fortnight; during this period eggs are laid.

“These eggs are now put into *saul* leaf boxes for four days, at the end of which time they begin to hatch, and are placed on clumps of either *Assun* or *saul* branches. After two or three days, the worms growing

stronger, no very great care is requisite, save to remove them from one branch to another when they have eaten all the leaves of that which they are on ; this is effected by cutting down the branch and placing it against another. In three weeks these worms weigh two chittacks each ; they cast their skin three times, after which they spin and are brought home, when they undergo boiling, and are after that fit for sale : those intended for seed of course are not boiled.

“ There are two *bunds*, first in the month of *Joisty* (May), second in the month of *Sraðun* (July).

“ The *castes* that follow the rearing of worms as a means of livelihood are “ Coormee,” “ Bhoomy,” “ Naick” and “ Manjee.”

“ During the period the worms are on the trees, men are on the watch night and day with bows, to drive away the birds, their greatest enemies.

“ In Purgunnah Bogree—

Rent of one <i>aurah</i> , equal to 4. biggahs, Rs.	2	12	0
In Goaultom each Assamee,	0	8	0
In Nuah <i>busut</i> , ditto,	0	10	0

“ The price of cocoons is never fixed ; eight *puns* make one *kahun*, which sells for 3-8, rising sometimes to 4-8.

“ To manufacture the cocoons into a thread, they are boiled in cow-dung and water, and drawn out into a fibre on a hand reel.”

Mr. Hugon states, that the Natives consider there are two varieties, the *Bhugy* and *Jharroo*. I do not think so. I believe them to be one and the same insect. The larva sometimes, for instance, when feeding on the common *bair* of the jungles, is of very dark green color, precisely that of the leaf itself, and might by some be considered as a different insect, when compared with one that has fed on the *badaam* (*T. catappa*), which is of a much lighter and prettier green, with a degree of transparency at the same time, and a slight tinge of yellow pervading it.

The fact of the perfect insect being devoid of any mouth has led me to infer, that the secretion, which it emits for the purpose of softening the substance of the very hard cocoon from which it has to make its escape, is voided from the abdomen ; and when effected, it has to turn *itself round in the cocoon* to enable it to set to work, with its two fore-feet, which are provided with extremely strong and curved

claws, and thread by thread, works for itself an opening through which, while yet moist, its escape from the cocoon is effected, and that too before its wings have in any way enlarged by expansion to impede its exit. It is my intention during this next rainy season to endeavour to ascertain this point beyond any doubt if possible; also the examination by analysis of the fluid emitted by the insect for thus softening the glutinous substance used in forming its cocoon.

The second drawing which Mr. Hodgson has sent down, representing the *Arrindy* or *Eria* moth of Assam, is stated by that gentleman to be the Indi moth of the Mechis. This, I take it, is a mere abbreviation of the word *Arrindy*, for in the Bograh district, I have remarked, that they call it the *Rindi* or *Renri-ka-poka*. This insect is domesticated in the Dinagepore, Rungpore and Bograh districts. Its food in Bengal is confined entirely to the leaves of the castor-oil plant (*Ricinus communis*). Mr. Hugon states, that when this plant fails it is fed upon several other trees in Assam, known by the following names—1st *Kossoal*, 2nd *Hindoo Gass*, 3rd *Meekeerda*, 4th *Okonnee*, 5th *Gomarree*, 6th *Litta Pakaree*, 7th *Borzonolly*. The above are forest trees, none of them being cultivated.

At page 23 of the *Asiatic Society's Journal*, Vol. vi., part 1, for 1837, further interesting particulars will be met with in Mr. Hugon's observations on the silk moths of Assam.

Darjeeling : June 17th, 1848.

MY DEAR SIR,—I have the pleasure to acknowledge your interesting communication on the silk-worms I sent you. My impression that the larger moth was identical with the *Deo Munga* of Assam, was derived from Major Jenkins, I having no opportunity at the moment to refer to Mr. Hugon's paper in the *Asiatic Society's Journal*. To judge by my specimens the sexes of this moth are distinguished not only

by the more deeply pectinated antennæ of the male, but by its *quasi plum bloom color*, so different from the pure rich yellow of the females. With regard to the distribution of the species, I apprehend that Mr. Frith is mistaken in supposing it does or can occur in climates like that of Darjeeling, for I not only never heard of the species here, but have failed in an experiment to rear it, which was carefully conducted under favorable circumstances, from cocoons got in the *saul* forest, by Mechis in my service, who are habituated to rear the tame species. Gentlemen who make collections in this quarter are apt to blend whatever they procure from the Tarai forest, and lower hills, and from the mountains above them, and I conjecture, that Mr. Frith's specimens of *Phalæna mylitta*, said to come from Darjeeling and Cherra Poonjee, were really obtained in the low lands beneath those places. I notice this point because of the numerous and important mistakes relative to the geographic distribution of Zoological and Botanical species which have thus been propagated. For example, Mr. Ogilvy was led in this manner to suppose an Otine bird (*Eupodotis Bengalensis*), an inhabitant of these vast and precipitous and heavily wooded mountains, and to name the species *Hemalaysensis*, though it be really as little capable of dwelling in such a habitat as is, I apprehend, the *Phalæna mylitta*, or, more generally, any species of silk-worm whatever. Silk-worms abound south and east upon or near the level of the plains, but I doubt if they pass the limits of Bengal in a north-westerly direction, even upon the plains; and, so far as I know, the Cosi river is their limit in that direction; nor do I believe, they are ever found tame or wild at elevations materially above the plain level in Bengal or in Hindostan. In the *saul* forests they may pass up towards the north-west as far as that forest extends, or to Hurdwar. But the *saul* forest is hardly elevated at all above the level of the adjacent plain; and Cherra at 4,000 and Darjeeling at 7,000 differ *toto*

cælo in characteristic productions, as in climate, from all places situated on the low open level of the Gangetic plains. The species identified by Mr. Frith with *Phalæna mylitta*, avoids the open plain, as well as the mountainous heights; and, as seems to me, is exclusively confined to primitive forests or the level, or near it, of the plains. If therefore the species be found wild in Bhaugulpore, Sylhet, Chittagong, or even Chota Nagpore, it is, I apprehend, confined in all those districts to the uncultivated and forest tracts at the base of their respective hill ranges. Further enquiry as to the food of the wild worm of the *saul* forest confirms my prior information, that this species feeds almost if not quite exclusively on the leaves of *Shorea robusta*; and, as that tree extends not westerly beyond Hurdwar, the habitat of Kussowlee appears to me dubious, unless there be some mistake about the species.

The above remarks may seem tiresome. But those who are aware of the stress now laid on the geographic distribution of species, and of the numerous errors of fact that have crept into the subject, as relates to this quarter, from the source above adverted to, will probably deem otherwise. My attention was drawn to the subject of the distribution of silk-worms in India, with reference to the notices which the classics have left us of the ancient trade of India with the west, in the Roman times particularly. In a long and valuable dissertation by Mr. Taylor, in the Journal of the Asiatic Society of Bengal, that gentleman had attempted to show that Assam was the *Serica regio* of the classics. But by a comparison of the principal commercial products of Assam, cited by Mr. T. in confirmation of his theory, with those of the Tarai and forest generally, or as far north-west as Hurdwar, I found that most of the assumed exclusively Assamese articles of trade, were not less products of the north-western continuation of that peculiar tract of country, *which alone, whether in Assam or beyond it towards Hindostan, yields those products.*

Silk however, seemed to me at first an exception, and it was therefore with pleasure that I discovered that different species of the worms producing it were found in the depths of the *saul* forest as far north-west as the Cosi, both in the domesticated and wild state. I doubt however whether the wild worm be found very much beyond that river, which may properly be called the natural boundary of Bengal towards the north-west; nor am I aware that any species of silk-worm is reared in the domestic state by a tribe or caste of people in Hindostan Proper, that is, the region bounded towards the Deccan and Bengal by the Vindhya, and a line thence drawn to the Cosi at Nâthpûr. "That which hath been is that which shall be;" whence those who are interested in the resuscitation of the industrial energies of the people of India reasonably turn in search of good omens for the future to the gorgeous accounts left us of the old Indian pelagic trade under the lower empire. Would we revive this trade we must learn accurately what India produces, and what are the special products of her several provinces, so that the scientific investigation of the distribution of species may very materially subserve important economic uses.

B. H. HODGSON.

In remarking further on Mr. Hodgson's observations in reply to my first notes on the Tussock moth of India, I have to state, that I did not therein give any description of the two insects, male and female, further than casually pointing out (in consequence of the error committed by Mr. Hodgson's artist in figuring the female insect with the antennæ of the male) that *one* characteristic distinction between the two sexes. I did not do so, as I had stated that a tolerably correct description of it was to be seen in the 7th volume of the *Naturalists' Library* (Entomology), page 146, and that this book might most probably be accessible to Mr. Hodgson. Mr. Hodgson is perfectly correct when he states that the

sexes are distinguishable not only by the deeply pectinated antennæ of the male "but by its *quasi plum bloom color*." There are, however, other considerable differences. The male, for instance, is almost always much smaller than the female: the wings never so deep or broad, nor so much rounded, but narrower and strongly falcate. The general color is something of a yellowish-brown, varying much in tint; indeed I have seen them almost as yellow as the female. Again, I have at the present moment a female in my collection that is as dark and of the same color as the males generally are. Two specimens of females I have also from Kussowlee, rather I should say I have four altogether, all females, from that locality, two of which are of the pure rich yellow color, described by Mr. Hodgson, the other two of a pale slaty color, and such as I never before met with. All the other markings are exactly the same as in the yellow-colored ones, and they are, beyond dispute, nothing but a variety of *Phalæna mylitta*, or the true Tusseh moth.

Regarding the geographical distribution of the species, I am almost at a loss how to satisfy Mr. Hodgson as to the circumstance of its being found at Darjeeling, having received it from thence myself, from a party collecting for me. Again, those from Cherra Poonjee were collected by persons on the spot who are employed by me for the sole purpose of forming entomological collections. I have just inspected a very fine collection, made by a gentleman at Mussooree, in which are no less than eleven species of true *Bombycidae*, viz. nine of the genus *Saturnia*, all new to me, and I have no doubt every one of them unfigured, and even undescribed; one of the genus *Arctias*, and one of *Phalæna mylitta*, or the true Tusseh moth. In my own collection, besides, I have three I consider to be new and undescribed, from Cherra Poonjee, one from China, and one from the Cape of Good Hope, or say Southern Africa. Capt. T. Hutton also, in the Transactions of the Entomological Society, Vol. iv., part 3, page 221, in

a letter addressed to J. O. Westwood, Esq., gives an account of the preparatory states of *Bombyx (Arctias) Silene* of India. These, as well as other specimens, were taken by him at Mussooree. Further, in another letter to the address of the same gentleman, dated from Mussooree, and published in Vol. v., part 2, page 45, of the Transactions, Capt. Hutton makes mention of his having frequently watched the escape of the Tussch moth from the cocoon by the aid of the liquid it brings into use for that purpose. I conclude, therefore, that he has also found them there.

But what will Mr. Hodgson say to the following description (with which I must conclude for the present) of a *new* Indian silk-moth discovered by Capt. Hutton at Mussooree, and a *true Bombyx* moreover? The following is the notice of it in Vol. 1, second series, of the *Annals and Magazine of Natural History*, p. 385 :—

“ J. O. Westwood, Esq., F.L.S., exhibited specimens of the silk spun by the caterpillars of the new Indian silk-moth, *Bombyx Huttoni*, West. (figured in the *Cabinet of Oriental Entomology*, pl. 12, fig. 4) communicated to him by Capt. T. Hutton. After stating the importance of the discovery of a new and valuable product of this nature in our foreign territories, and that the Transactions of the Linnæan Society contained a valuable paper on East Indian silk insects by General Hardwicke, Mr. Westwood observed that the insect discovered by Capt. Hutton was congeneric with the real silk insect *Bombyx mori*, a native of China, whereas those described in the Transactions of the Society belonged to another genus, *Saturnia*, and that, consequently, the silk spun by the new species was likely to approximate nearer to that of *B. mori* in its qualities than that of the large Indian *Saturniæ*. The new species had been discovered to be a native of the hills about Mussooree, on the southern side of the Himalaya, 6,500 feet above the level of the sea ; and its caterpillars, like that of *B. mori*, feed on the leaves

of the wild mulberry, which is another reason why the qualities of the silk should resemble that spun by the true silk-worm. The perfect moth is about the size of *B. mori*, but has darker-colored wings, with a large blackish lunate spot near the tips of the hooked forewings. Specimens of the natural fibre of the silk, and some with the threads severally composed of three, six, nine and twelve fibres, having been pronounced by the Delhi silk workers to be worth 25 rupees per seer, that is, about 25 shillings per pound, at 2 shillings per rupee."

I may, perhaps, at some future date, offer some further remarks on the distribution and habits of the Tusseh moth, when I have obtained more certain data to guide me; and which, I trust, may prove more satisfactory to Mr. Hodgson.

Calcutta : July, 1848.

R. W. G. FRITH.

Darjeeling : August 17th, 1848.

MY DEAR SIR,—I have the pleasure to acknowledge your second obliging communication on the subject of silk-worms. Their wide diffusion throughout the continent of India in the plains seems clear, and is a very interesting circumstance with reference to what we find in the classics about the trade of India with Europe in the latter days of Rome and thereafter. Mr. Taylor supposed that the chief "things in commerce" in those days were products of Assam only. But I had long before traced most of them as indigenous products of all India extra Gangem, from Suddiah to Hurdwar, leaving silk only as an apparent exception. It need be so no longer: fine wild worms of various kinds being, it now appears, found north-west all the way to the *debouche* of the Ganges into the plains. So far then, I agree with Mr. Frith, and thank him much for the information he has supplied. But I confess myself still quite a sceptic as to the alleged fact of the silk-worms tenanting these mountains at elevations like

that of Darjeeling, and I have lately enforced my doubts by strong negative evidence, to wit,—There are now here two enthusiastic entomological collectors, who have made splendid collections. To them I sent my silk-worms, desiring to know if they had any specimens. The answer of both was—“Nothing of the sort seen or heard of at Darjeeling, either in glen or on hill top.” I apprehend, therefore, that Capt. H.’s and Mr. F.’s specimens were not got at Mussooree or Darjeeling, but in or near the plains in the vicinity of those hill stations.

B. H. HODGSON.

Since the above has been put in type, I see by Mr. Hodgson’s last communication, that he still will not allow the possibility of silk-worms inhabiting such an elevated mountain range as that of Darjeeling; and states further, that he has enforced his doubts by strong negative evidence from the fact of there being at present, resident at Darjeeling, two enthusiastic entomological collectors, to whom Mr. Hodgson has shown his silk-worms, and these gentlemen declare that nothing of the sort has been seen or heard of at Darjeeling “either in glen or on hill top.” Now, I beg to say, with every deference to Mr. Hodgson and these two gentlemen, that I do not consider that because the latter have not seen or heard of the Tusseh moth at Darjeeling that it should be a proof of its non-existence in that locality. Surely it is much more likely that it does exist there, from the circumstance of its being found in the whole of the eastern range of hills from Chittagong up to Assam, at such an elevation as Cherra Poonjée, and again in the western Himalaya, at Mussooree and Kussówlee, the former only 500 feet below the elevation of Darjeeling. Besides, it often occurs that one collector may capture one or more specimens of an insect in the same locality where others may be less fortunate, and procure none at all, from various

causes that occasion the existence of members of the insect world from being found in fewer or greater numbers in corresponding seasons in one and the same locality. As long for instance as I have been collecting, I may mention one fact to the point, that of my never having taken a single specimen of the genus *Paussus*; I do not however doubt for a moment the possibility of its existence in this part of India, indeed I know several specimens to have been secured in the district of Furreedpore by a brother collector.

Calcutta : August 28th, 1848.

R. W. G. FRITH.

Memorandum regarding various Fibrous materials from Assam and Chittagong.

Since the commencement of the present year, the Society's Museum has been enriched by several specimens of vegetable fibres forwarded by its zealous correspondent and member, Major Jenkins, the Commissioner of Assam. These specimens have been presented, as received, at the various monthly meetings, and certain details regarding them simultaneously communicated. To bring these particulars into a continuous form, and give them the prominence which, it is deemed, the importance of the subject merits, is the object of the following memorandum.

I.—Fibre of the *Rheea* of Assam, *Caloe* of Sumatra, *Urtica tenacissima*, Roxb. A reference to Roxburgh's "Observations on substitutes for hemp and flax," will show that that eminent practical botanist, was well acquainted with the useful properties of this plant, and endeavoured long ago to bring it to the notice of the Indian Government. In a letter addressed in 1809, to the Secretary to the Board of Trade, he thus writes :

"I have received your letter of the 17th instant, with the two extracts therein mentioned, and beg you will be pleased

to inform the members of the Board of Trade, that since the beginning of my botanical career, no plant has given me more anxiety than that which produces the *Caloee*.

“From the receipt of the first sample sent to me by Mr. Ewer, from Bencoolen, I saw its quality was uncommonly interesting, and promised to be superior to every other vegetable fibre I had seen. I was therefore more than usually solicitous to obtain the plant which produced so promising a material, as a substitute for both hemp and flax, and in 1803, four were received into this garden from Mr. Ewer, at Bencoolen; since which period, some thousand plants have been reared from these four, so readily does it grow and multiply. But to this day, I have not been able to discover a ready way to clean the fibres. At present, a man rarely cleans more than half a pound in a day, which alone comes to sixteen rupees the maund. I understand the Malays on Sumatra follow the same mode of cleaning which I have hitherto found the best, viz. by scraping away the pulpy parts, &c., immediately when peeled from the fresh cut shoots: no kind of maceration nor coction have I found to answer; however, as I have applied for information to various quarters, and am still making experiments myself, I do not yet despair of falling on a more profitable method than scraping. The plant has every advantage we could wish in growing readily in this country, being perennial, and yielding three or four crops or cuttings annually; so that if we can only overcome the obstacles that now present themselves in cleaning the material, I am inclined to think it would, in the course of time, supersede every other, for canvas and cordage, yet known. I would therefore, by all means, recommend as extended a cultivation as the plant will admit, which must be very limited for years yet to come, because it has not hitherto produced good seed, nor even from its native country could I ever obtain any, which is scarce to be expected from a plant usually reared from cuttings and slips, (as in

the common pine-apple, plantain, &c.,) a mode of culture which soon deprives them of fertile seed. This plant must therefore be multiplied by suckers, cuttings, and layers, which can best be done during the rains."

It is not mentioned if this recommendation was attended to, or whether any further experiments for a readier mode of preparing the fibre were attempted.

The Society, it may be observed, has received various specimens of this material at different periods, in addition to those to be hereafter noticed, but it does not appear that any of them have been fairly tested or reported on. It was sent by Major Jenkins from Cachar in 1833; and subsequently from Assam. He describes what he procured in the first-named province, "as more like good hempen twine than that made from any plant in India, and from one small sample I saw well bleached, it would, I imagine, make a very neat canvas."—(Transactions volume 2, page 171.) Col. Burney also, when Resident at Ava, sent a specimen, the produce of the Shan Provinces of Pevela and Youkzouk, lying 6 or 8 days' journey to the south-east of Ava. He speaks of the superior quality of the material, observing he was informed that the Shans, who call it *Pan*, "use it in manufacturing every kind of cordage, and weaving a stout kind of cloth, of which they make bags."—(Volume 3, page 11.) Major Macfarquhar likewise forwarded some of it, raised at Tavoy on the Tenasserim Coast, from a few shoots sent to him by Col. Burney, from Ava in 1836. "It is cultivated," he remarks, "by the Shans, Siamese, and the Chinese; the two latter, with whom I have spoken on the subject, are loud in its praise for its fineness of texture and durability, both as cloth and cordage."—(Volume 5, page 19.) Again, at a later period, specimens were submitted by the late Mr. Landers, a traveller in the Shan country, who corroborated, from personal experience, the information obtained by Col. Burney.—(Journal, vol. 2, p. 253.)

In the first part of the present volume, will be found an interesting paper descriptive of the mode of cultivating this plant, and preparing the fibre in Rungpore, in which, as also in the neighbouring district of Dinagepore, it is known under the name of "*Kunchoora*."*

The specimens noticed above, and last forwarded by Major Jenkins, consist of—

1. A specimen of cultivated *Rheea*, sent to Major Jenkins by Major Hannay, "in just that state in which it is prepared by the Assamese fishermen."

2. Also a specimen of the same, prepared and bleached by Mr. G. H. Grose; and

3. Another specimen of textile fibre from Major Hannay, called *Bon Rheea*, "an uncultivated *Urtica*, very common in all parts of the Province."

On these specimens Capt. Thompson reports as follows:—

No. 1. "The fibre in this state possesses all the properties of hemp for making cordage; hackles easily and leaves very little waste. It is rather rigid and wiry for ship use, but in my opinion, were it the least more flexible, it would make excellent cordage for any purpose. I am preparing some of it with tar, and when I have ascertained how it stands that test, will report more fully.

No. 2. This specimen is injured, I think, by being too much bleached, the fibre has lost its strength and staple, and in attempting to dress it with the hackle, three-fourths of it remained as seconds, part of which I have had spun into twine (herewith sent), but from the cause above stated, it has not near the strength of the other samples. The "sail-cloth weavers" say it would make excellent canvas if less bleached.

No. 3. This specimen speaks for itself: it is, I think, all that can be desired for either canvas or lines, and only requires to be known to be generally used for that purpose. This

* Notes on the *Kunchoora* fibre of Rungpore, by Dr. Campbell, Superintendent of Darjeeling, and T. F. Menley, Esq. Part 1, Vol. vi., p. 30.

specimen, as well as No. 1, from the method of preparation, being all in small twisted quantities, and dried in that state, resisted the hackle, and cannot be dressed without much waste and injury to the fibre."

II.—Fibre of *Bauhinia scandens*, and cloth made therefrom. These specimens were also sent to Major Jenkins by Major Hannay, who mentions that the fibre is used by the Nagas. The plant, Major Jenkins adds, is not uncommon about Gowhatti. It was recognized by Dr. Falconer, from a few leaves forwarded by Major Jenkins, to belong to *Bauhinia scandens*, a common species in Sylhet, and he adds—"The fibres produced from the maceration of the bark of two other species of the same genus, viz. "*Bauhinia racemosa*" and "*B. parviflora*," are extensively used in making a rough description of cordage in the low valleys of the hills on the north-western provinces, specially for rude suspension bridges. The produce of a species of *Bauhinia* was one of the substitutes for hemp reported upon by Dr. Roxburgh."

Captain Thompson having tested this fibre reports on it to the following effect:—

"The line made from the fibre, sent by Major Jenkins, sustained for 45 minutes, 168lbs., having stretched 6 inches only in 3 feet, and therefore is about the same strength with our best *sun* hemp. But whether from the mode of preparation or the nature of the material, is so harsh and stubborn, and the fibres stick so close together, that the hackles tear it to pieces, and injures its strength. I made the same remark on the samples of *Rhea* from Assam, and suppose it must arise from the mode of preparation."

III.—Primitive cloth made from the bark of *Celtis orientalis*. This specimen accompanied that of *Bauhinia scandens*. Major Jenkins intimates, that it is made by the Garrows; "they make several such cloths of different colors from various barks, and though these manufactures would seem cheap enough, they are not usually at the expence or labor

of even such rough clothing for themselves ; preferring apparently to go naked ; they import at least 100,000 maunds of cotton, but to my knowledge do not weave a seer for themselves. The Garrows who come to the plains have generally some small ends of cloths, but these are bought from the Bengalis, apparently to attend the *hauts* in, not as clothing to protect them from wind and weather."

— And Dr. Falconer gives the following additional particulars on the subject :—"The leaf specimens from Major Jenkins, are those of *Celtis orientalis*, a tree which is pretty common all over India, and known under the name of "Chekoñ" in Bengal. It is botanically closely allied to the "Elm," but it is not prized as a timber. Dr. Roxburgh's summary of it is, "this tree is neither useful nor ornamental, nor is it of long duration." The cloth produced from it by the Garrows, was described by Buchanan Hamilton many years ago. He calls it "Jangfung," "probably misprinted for Yangfung," as Capt. Reynolds names Major Jenkins' specimen "Am-fuk." B. Hamilton says, "the under bark of this tree, like that of the West India kind, consisting of numerous reticulated fibres, form a kind of natural cloth used by the Garrows for covering their nakedness."—*Lin. Trans.* 17, p. 209. He also describes it in his report on Assam as a kind of rug worn by the Garrows in the cold weather, and serving them as a blanket by night.—*Vide* M. Martin's *Eastern India*, vol. 3, page 694. It would be interesting to know what the other cloths mentioned by Major Jenkins are produced from."

IV.—Fibre of *Callicarpa cana*. For this specimen the Society is indebted to A. Sconce, Esq., Collector of Chittagong, who in a letter, dated March 1848, to the address of the Secretary, thus writes regarding it : "I send you a small package containing some of the fibre of a plant which you named for me in July last, and which appears to me worth the notice of the Society. You may remember I sent you the leaf of a plant which grew in the jungles here very much in the

fashion of the *Urtica tenacissima*. This you were good enough to inform me was the *Callicarpa cana*. I had a considerable quantity of the stalks cut and steeped. By steeping, the outer bark rotted and smelt as offensively as hemp, and the inner fibre slipped off. This fibre, after being dried, I had hackled, and what I send you is a specimen. I had also a portion spun; and though this has been coarsely done, it will be sufficient to show you that the fibre gives a very strong thread.

“The stalks of the plant grow three or four feet high; many stalks from one root. Should this plant be found in the neighbourhood of Calcutta, could any one who is skilled in the preparation of hemp, be induced to experiment with it? I could easily send several bundles for that purpose; but I rather think that unless the stalks be steeped immediately after being cut, the fibrous quality of the bark disappears.

“In one respect, this plant has a decided advantage over the *Urtica*, namely the readiness with which the fibre is separated from the wood. I think also that the fibre is strong and comparatively fine, what I cut last year were stalks of an unlimited age. This year, I shall be able to cut some of this season's growth.”

And in a subsequent communication he adds:—“I find that the stalks much improve in size by cultivation, but I have not yet extracted the fibre from the shrubs which I transplanted. The native name of the plant here is *Aroosha*.”

Captain Thompson, to whom this specimen was also referred, thus reports on it:—

“The line made of the fibre of *Callicarpa cana*, sent from Chittagong, broke at once without stretching, with only 127 pounds; only the finest and longest of the material was made into this line, while in the other (the sample was so small) that the refuse was worked up with the best. A line of Russian hemp of the same size with the two herewith sent,

will sustain with ease 400 pounds, so that this fibre is much too weak for either sail-cloth or cordage.

“ It however possesses all the free and kindly nature of flax, and even smells like flax ; it is easily worked with little or no waste, and I think must have been prepared with vegetable oil.”

The above can scarcely be considered a fair test of the strength of this fibre, not only because the sample sent was too small, but because it was prepared from “ stalks of an unlimited age.” Mr. Sconce has been requested to forward another and larger sample prepared from the plants which are now under cultivation, the report on which will be furnished in a subsequent paper. It only remains to add in this place, that though the Society’s museum is very rich in fibrous materials, it did not previously possess a specimen of the fibre of *CalliCARPA cuna*. In his treatise on substitutes for hemp and flax, already referred to, Roxburgh makes no mention of this fibre, nor does he allude in his *Flora Indica* to the plant possessing this property. From this circumstance it may be inferred he was not aware of it, as he never appears to have allowed an opportunity to pass of drawing attention to the useful properties of plants described by him, but on the contrary to have ever been desirous of rendering his botanical acquirements subservient to the dissemination of useful information in connection with every department of the vegetable kingdom.

Further remarks regarding the cultivation of the Mexican Cotton plant in India, and the proper season for sowing. By Dr. R. WIGHT, Superintendent, Government Cotton Farms, Coimbatore.

I send you herewith a copy of a circular I lately drew up for distribution among my friends in this part of India, and especially among our revenue officers, on the subject of Mexican cotton cultivation, having special reference to the sowing season. I am now preparing to give the plan as extensive a trial as possible in this district, especially in those portions which the American planters view as most unfavorably situated for the purpose. This I do the more readily, as a small portion of our last crop sown before the middle of June turned out exceedingly well, and produced the best cotton we have yet grown. As it happened, indeed, it was the only part of our crop that made a satisfactory return, that from the later sowings having been almost all destroyed by an unusually heavy and protracted monsoon. The beginning of October last, the promising appearance of our fields led me to anticipate a crop little short of 400 bales, which would have been equivalent to about 800 lbs. per acre all over. If I now realize the half, I shall think myself fortunate. Enough has, it strikes me, been done to show that in cultivating the Mexican cotton plant as an extra tropical one, we have committed an error; as a review of our past operations, aided by the facts recently brought to light, seems scarcely to leave room for a doubt as to its tropical habits, and leads to the conviction, that treated as a tropical plant, every part of India is adapted to its successful cultivation. It is under this impression I am now urging a change in our plan of culture.

COIMBATORE : 16th March, 1848.

I regret that a pressure of duty prevented my sooner attending to your note of the 19th ultimo, the more so as I fear any seed I may now send, beyond a few banghy packets, will be too late for the June Steamer. Had time permitted, I should have sent you at least two cooley-loads to be forwarded by that quick mode of conveyance. Should such be your wish, I expect towards the end of the year, to be able to furnish any quantity you may require, and in the mean time shall forward some banghy packets to the care of the Secretary to Government, and request the favor of his forwarding them by the Steamer. I trust they may reach you in time, but fear they will be rather late for this season.* Those intending to give it a trial should get the ground ready in anticipation. We had some fine showers about the middle of April, and took immediate advantage of them to sow a field previously prepared. So far as it has yet gone, this first trial has proved very satisfactory in establishing the fact of the highly tropical character of the Mexican cotton plant, and in proving its capability of sustaining uninjured, even in its earliest stages, both drought and high temperature. Already the young plants are from 6 to 8 inches high, and most healthy, though for the last three weeks there has been no rain, and the thermometer, in the house, has ranged from 80° to 90°, with a clear cloudless sky. Several other fields have since been sown, all of which are doing equally well. From this beginning I anticipate the most favorable results; but, however they may terminate, I shall not fail to communicate them to the Society, strengthened, I trust, with many encouraging reports from other quarters.

* These packets did not, unfortunately, reach the Society before the middle of June; but no time was lost in dispatching them to various localities on this side of India; to Beerbhoom, Bhaugulpore, Chota Nagpore, Tirhoot, Gorruckpore, Benares, Allahabad, Lucknow, Banda, Cawnpore, and Agra, on the one side; and to Chittagong, Dacca and Gowhatti on the other: while a small proportion of the seed has been sown in the Society's garden.—EDS.

As regards the natural habit of this plant, it appears to thrive, though but sparingly supplied with water, but bears much rain during its growing season without injury to the crop, provided it has drainage, and clear warm weather at the season of maturity. On low wet ground it grows luxuriantly, produces largely, but the out-turn is rarely in proportion to the promise except in very warm and bright weather. Cold winds, or damp cloudy weather, at the season of maturity, I find most injurious; the former injuring its health, curling the leaves, and blighting the young flowers; the latter preventing or delaying the opening of the pods, thereby causing the deterioration of their contents, apparently through the retained juices acting on the fibre, and more or less completely rotting it in the pod. Clear warm weather, therefore, at the season of maturity, seems essential to the production of a crop of really good strong-stapled cotton, which it effects by the rapid evaporation of the moisture of the full grown pod, and causing it to burst before the contained juices have had time to injure the fibre. This fact should be kept in view in determining the sowing season, which should be, as far as possible, selected with a view to obtaining bright warm weather for harvesting the crop. In other respects the culture is simple enough—deep ploughing, liberal hoeing, and dry bottom.

COIMBATORE : 16th May, 1848.

“A subject of much importance, in connexion with the successful prosecution of the experiment now in progress for the naturalization of the Mexican cotton plant in India, namely, the proper sowing season, has recently engaged much attention, and has, in the course of its discussion, led to the promulgation of three distinct sets of opinions, more or less differing from each other. Two of these being easily submitted to the test of experiment, claim being subjected to that ordeal on a widely extended scale, though not on

an expensive one, the more so as the results obtained, in the course of their investigation, must, almost unavoidably, decide the correctness or otherwise of the third. I now therefore address you for the purpose of soliciting your attention to a very simple experiment which, I anticipate, will go far towards, if it does not quite suffice to solve the problem now under discussion. But to place the matter before you in a clear and intelligible point of view, it seems necessary before stating my plans, to glance very briefly at the circumstances which have given rise to this application.

“2. The experiment, it is generally known, was commenced under the guidance of professional American cotton planters from the State of Mississippi, an extra-tropical province, lying between the 30th and 35th parallels of north latitude. These persons, on their arrival in India, were very naturally struck with the great difference of temperature existing between India and the region in which they had hitherto cultivated the Mexican cotton plant, and perhaps, from previous success in the cooler country, believing it to be a native of the high and cool table-land of Mexico, at once concluded, that the Indian climate was much too hot for its successful cultivation, except and even then but imperfectly, during the coolest season of the year. This opinion, which many circumstances which have occurred in the course of the experiment, has tended more or less to invalidate, they all still retain. No later than July last, Mr. Mercer, an excellent planter and very intelligent man, stated to the Manchester Commercial Association as his belief, that the growth of cotton in India, from New Orleans seed, must necessarily be limited, as it could only be grown in peculiar climates: that in the district of Dharwar it had found such a climate and succeeded, but that that was owing to the region of Dharwar having a mild climate: that in some portions of Candeish and Coimbatore having similarly mild climates, it equally succeeded in both places, but concluded that, as the extent of country so favored was upon the whole limited, Great Britain could only expect to derive a small proportion of her cotton, of that description, from India.

“3. About the time he was making these statements in England, I was engaged in drafting a letter to the Secretary to the Agricultural Society in India, which was read at the September meeting of the

Society, and immediately published in the Indian Newspapers.* In that letter I stated in effect, that it appeared to me, that what we had principally to attend to in the cultivation of the Mexican cotton plant in India, was not so much the heat of the seasons as the adaptation of the sowing to the monsoons, so as to secure for the plant, during the rains, a growing season of from 12 to 16 weeks immediately preceding the period of bright sunshine, which usually succeeds on their discontinuance, for harvesting the crops which would then be attaining maturity. According to these views, the preliminary showers of May and latter end of September, which respectively usher in the SW. and NE. monsoons in regions under their influence, were indicated as the proper sowing seasons.

"4. Since that time I have been in correspondence with Mr. Jame Lees, of Manchester, a Member of the Commercial Association of that city, who has examined the subject in all its bearings, with the most elaborate care and attention.

"5. His first object was to establish the fact that the plant is truly of tropical origin, by showing that it is a Native of the *Tierras Calientes*, or hot districts of Mexico, lying under nearly the same parallels of latitude as the Indian Peninsula, and in many respects corresponding in climate. Secondly, that in its native country, where it naturally sows itself, it begins to vegetate with the rains in May and produces its crop in September, and that the cotton so grown in these hot districts is considered better than that grown from Mexican seed in the United States, however carefully cultivated: and lastly, he examined the practical results obtained in this and other countries where its cultivation has been attempted.

"6. The conclusions at which he arrives from this extended examination are, that the American planters have taken an erroneous view of the constitution and habits of the plant in supposing that it requires so cool or mild a climate, as they say it does, and that the views I promulgated are correct, only in so far as they relate to the countries under the influence of the SW. monsoon, but are erroneous as applied to those under the NE., because the

* See *Calcutta Star* 14th, *Madras Spectator* 27th September, 1847, and *Journal of the Agri-Horticultural Society of India*, Part 2, Vol. vi., page 118.

natural growing season of the plant being during the summer months (May, June and July), he affirms we ought, in bringing it to India, enjoying seasons similar to those of its native country, to conform to its native habits, and, by sowing in May, secure for it in India as in Mexico, its natural growing season, and urges that it is only by following such a course, we need hope for success. In a word, he insists that the proper season for sowing Mexican cotton in India is at the same time that our ryots sow their spring crops of *cholum* and *cumboo* : which he enforces by adducing the fact, that in Egypt, where both crops are cultivated by irrigation, the Egyptian wheel can raise water enough to irrigate three acres of cotton, but only two of *cholum*, thence deducing the inference that cotton requires less water than *cholum* to perfect its crop, and consequently that the amount of rain that in India is found sufficient for the latter (which rarely fails), ought to suffice for the former.

“7. ‘By sowing at the natural time,’ he observes, ‘there would not only be more certainty of crop but other most important results would be obtained. The crop would at all times be much greater and the staple of the cotton much superior. These results would follow from a more perfect development of the plant. The observance of the natural sowing time will produce the most perfect development of which the plant is susceptible. It will then be sown at that period of the growing season when the soil and the climate are in the most heated state, and when this heat combines with those gentle showers, which at that time occur, to promote to the utmost the rapidity and vigour of the germination of the seed, and when also after germination has taken place, the subsequent growing season will be more prolonged and propitious than at any other period of the year.’

“8. Without, in the present state of our knowledge, venturing to go so far as to subscribe to these views to their full extent, I believe I am perfectly justified in urging as the least we can do, in return for the pains bestowed by the writer of these very able and elaborate letters, (of which I have only been able to give a brief summary, furnishing a very imperfect idea of the conclusiveness, as a whole, of the arguments adduced) is to institute over a wide range of country numerous comparative experiments. This I conceive may be done

without trouble or expence: all that is required being to ask, a few ryots in each district, when sowing their *cholum*, to sow a few handful of Mexican cotton seed in any convenient spot in the same fields and watch the result. In this way the correctness or otherwise of the statement regarding the relative quantities of moisture required for perfecting crops of cotton and *cholum* will be established on a wide and satisfactory basis, and if found correct, may prove the means of at once introducing the culture of the exotic cotton into many parts of the country where it has not yet been heard of. But whether these first trials fail or succeed in districts under the influence of the NE. monsoon, the experiment should be repeated in October, for the purpose of ascertaining whether it is as certain and productive during the hot as the cool season, keeping the double object in view of confirming or refuting the opinions of the American planters regarding the necessity of a mild climate for its successful culture.

“ 9. In confirmation of Mr. Lees’ views, it seems but fair to state, that a large proportion of our crops has usually been gathered during the hottest months—March and April—that at these times the exotic seemed to bear the heat better than the native plant—and that, as regards the present season, the only fields which have as yet made a satisfactory return, were sown in May or the very beginning of June. The crops of all those sown after the middle of June, though equally promising on the 10th October, when the unusually abundant and protracted rains of this season commenced, have been nearly ruined. The plants however, apparently true to their natural habit of bearing during bright warm weather, have latterly greatly recovered their health, and are again in full bloom, promising as usual, a respectable crop—the season continuing clear and dry—in March and April. Samples of the May sown cotton, picked during very warm weather in September, have moreover been pronounced in England the best yet grown in India, another important fact in support of the same views.

“ 10. In conclusion I beg again to state, that I think the least we can do, in return for the labor bestowed by our Manchester friend, is to set on foot, over a widely extended tract of country, the very simple experiments here suggested, lest, by failing to do so, we expose ourselves to obloquy on the ground of improper prejudice or

obstinacy in neglecting to adopt measures fitted to decide a matter of the highest importance to the welfare of India. Those wishing to engage in these experiments can be supplied with seed from the farms, and as small quantities will suffice in the first instance for several such experiments, even the most distant stations might be supplied by means of banghy packets, in sufficient time for the approaching season.

“ 11. Reports, recording the results of the experiments are requested, and will be carefully examined, and a general summary, embodying the evidence furnished by the whole, will be published as soon as it can be completed.

ROBERT WIGHT, *Surgeon,*
Superintendent Cotton Farms.”

COIMBATORE : 6th March, 1848.

NOTE.—It did not occur to me, while drafting this Circular, that it was deficient in not supplying some criterion by which to estimate the comparative success or otherwise of the proposed experiments. The following particulars, extracted from the report of Mr. Mercer's statements to the Manchester Association, will partially remove the deficiency by providing some data for forming such an estimate :—

“ In Dhurwar, Mr. Mercer states, that the New Orleans cotton plant is small, only attaining the height of from 12 to 18 inches, and bearing on an average, only about 5 pods. The seed is therefore sown in rows, only 20 inches apart, and the young plants turned out to, I presume, from 12 to 15 inches from plant to plant. The aggregate produce of an acre so planted, is stated to be from 180 to 200 lbs. of *kuppas* or seed cotton, which is found a remunerating crop.

“ There is probably some error in the above figures, as I find by calculation, allowing each pod to contain only 50 grains weight of *kuppas*, that the aggregate amounts to somewhat over 400 lbs. per acre, so that an average produce of 5 pods per plant may be considered a fair crop.”

Observations on the failure of seeds of cereal grasses forwarded to the Society by the Court of Directors, and of the Oat and Carrot seed sent to the Stud Farms of the North-west of India. Communicated by Dr. ROYLE in a letter to J. C. MELVILLE, Esq., Secretary to the Court of Directors.

[Presented by the Government of India.]

In the accompanying letter from the Bengal Government, dated the 30th January 1847, a second application is forwarded from the Agricultural and Horticultural Society of India, for a further supply of agricultural seeds, in pursuance of the promise made by the Court to the Society in 1841, to send occasional supplies of such seeds as are deemed of importance by the most speedy conveyance.

The seeds last sent by the Court in 1845 were ordered from Messrs. Wrench, and were reported to have arrived in Calcutta apparently in excellent order, but like the many other consignments which the Society has received of seeds sent in large quantities, these failed, though no difficulty is experienced generally in obtaining even so delicate a seed as that of the *Deodar* by the overland route. On the present occasion it is taken for granted, that the failure is owing to the seeds of the previous autumn having been sent, and that better success would attend a consignment of the present year's crop to be sent by the August mail.

I fear that this course would not be attended with a more successful result, for the experiment has already been made by sending oat and carrot seeds to the stud farms, by the overland conveyance of the 19th June, in the same year that the agricultural seeds were sent by sea to the Society.

As I have already made some remarks on what I conceive to be the causes of the failure, I would beg leave to subjoin a copy of them, though they have already been presented in the Military Department.

I conceive the cause of failure to be the heating of the seeds from the mode of packing, and to their being sent at the hottest season of the year. The remedy I would suggest is, the sending of seeds in the *ear* or in *pod*, also to have them more closely packed, and in simple but thick wooden cases, and without any outer tin case. But instead of making such an experiment on a large scale, I would beg to be authorized to make three or four small experiments in different seasons of the year, and with the crops of different seasons I would send only a single box, packed as I have suggested at each time. If the experiment succeeds, it would afterwards require only a multiplication of their number, not an increase of their size.

EAST INDIA HOUSE: *5th July, 1817.*

The oat and carrot seed sent by Messrs. Wrench for cultivation in the stud farms of the North-western Provinces of India, having failed, though sent by the Steamer of the 19th June, it is taken for granted, that this failure is owing to seed of the previous year having been sent, and it is suggested as a remedy, that seed of the present harvest should be despatched by the mail of the 20th of August, so as to reach India in time to be sown at the central stud farms at the beginning of the ensuing cold season.

Without in any way deprecating the value of the fresh seed, it must however be observed, that it is extremely difficult to ascertain with certainty the true causes of the numerous failures which have taken place in the transmission of seeds sent in bulk to different parts of India, both by the Egyptian route and by that round the Cape of Good Hope; by this observation I allude to the several attempts made at considerable expence by the Agri-Horticultural Society of India to obtain fresh seeds from England, both of

cereal grains and of the ordinary kitchen vegetables.* In these experiments the result has been, that seeds from England sent in bulk, have usually failed, while those from North America have often succeeded; also, that success has very generally attended those imported from the Cape of Good Hope. The temperature of the season during which the seeds have been ripened, has probably some influence upon the germination of the seeds in a country like India, where the season of sowing being at the beginning of the cold weather, the temperature both of the earth and air is a gradually *diminishing* one, while in England that of both is on the contrary, a gradually *increasing* one; but this cause ought to affect all foreign seeds alike.

With respect to the freshness of seed, or rather to the seed sent having been that of the previous harvest, I would remark, that though there is no doubt of the superiority of the freshest seed, yet carrot seed, of the best quality, is frequently found to fail even in this country, and that oats, which have been stocked for two or three years, will vegetate nearly as freely as fresher seed.

It appears to me, that failure is to be ascribed to the detriment sustained by the seed during transmission to India rather than to any original defect. In the first place I conceive, that the mere sending of seed in *bulk* is injurious from the *heating* which must necessarily take place, and

* It is worthy of remark, that the last consignment of *flower* seeds received by the Society by the overland conveyance, in October 1847, germinated most freely. It consisted of an assortment of the *latest* gathering, and most of the varieties were scarcely two months old at the period of sowing. One-half the consignment was subdivided by the Seedsman (Mr. Carter of Holborn), the other was despatched *in bulk*; both proved equally good. The boxes were lined with tin, and made airtight by careful soldering. Previous consignments of flower seeds from England had generally caused disappointment, and this is attributed to their having been despatched earlier in the year than the month of August, thereby involving the necessity of sending seeds of a former season's gathering.—Eus.

which is observed to occur even in granaries of small extent in this country. This natural *heating* must necessarily be greatly encouraged during transmission in close, often tinned boxes, along the Mediterranean, down the Red Sea and across the Indian Ocean, especially as the transmission of seeds in bulk has always taken place during the hottest time of the year, when even the cabins of the steamers are described as being intolerably hot, and the close place into which the seeds are placed along with the other packets must be much more so, and the seeds, as observed to me by Dr. Wallich, "must be very very sound, very strong, and very fresh, not to perish." In the transmission round the Cape of Good Hope, the seeds usually enclosed in the tin cases and placed in the hold of the ship, where there is necessarily great heat with moisture, and sent round at the hottest time of the year, will be subjected to successive heatings and coolings in twice crossing the line and once rounding the Cape. Seeds however are sent to and received from India by the Egyptian route, and vegetate freely. For instance the *Deodar*, which is as difficult of transmission as most others, is now received in considerable quantities, but in moderate packets, and vegetates so freely that the country will be covered with forests of *Deodar*: so also cuttings of fruit trees have been sent to Dr. Jamieson at Seharunpore, and have been reported upon by him to have arrived as fresh as if they had just been cut off from their parent trees, and several of them have produced fine healthy plants in the Mussooree garden. These transmissions of cuttings however succeed only in the winter season of this country, and the cold weather of India. As I do not despair of eventual success, notwithstanding the numerous failures, I would suggest a number of small experiments being made in different ways, so as to ascertain, if possible, the causes of failure, and then determine upon the mode of insuring success in future.

1st. I would recommend that oats, wheat and other grains, intended for seed, should be sent in the car, (or in their seed vessels) and not after they have been threshed out.*

2nd. That all seed, sent for such purposes, should be loosely packed in thick deal boxes and without tin cases, and not be allowed to be put into the hold of a ship or steamer.

3rd. That seeds of cereal grains should be sent, thus packed, at different seasons of the year, so as to ascertain the effects on them of the temperature experienced in transmission during the different parts of the year.

4th. That the seed of cereal grains, &c., which ripen the earliest this year, should immediately be transmitted to India, and if possible, as requested, by the steamer of the 20th August. But as it is possible that it may arrive too late for sowing in all the stud farms, I would recommend a portion of it being tried in the Himalayas early in the spring, so as to ascertain vegetative powers, and if possible, obtain a crop for sowing in the subsequent autumn in the plains of India.

*Some of these experiments, I propose, carrying on through the Botanic Garden at Scharunporc, which is in the immediate vicinity of one of the studs.

(Signed) J. FORBES ROYLE, M.D.

EAST INDIA HOUSE :

10th May, 1847.

* The result of a trial on cereal grain and other seeds, sent in accordance with this suggestion, will be found at page 145 of this number, in the department of correspondence and selections.—EDS.

*Observations on the indigenous Cotton of India.**By J. G. BRUCE, Esq.*

I beg to enclose a copy of a letter which I wrote in March last, in reply to two I received on the subject of the indigenous cotton. The object of my troubling you is to solicit the favor of your procuring for me the insertion of it, along with my present letter, in the Transactions of the Agricultural and Horticultural Society, that their publication may be the means of attracting the notice of the Government, as well as of the associations and manufacturers in England, who have been memorializing and urging the authorities for an increased cultivation; and its becoming known that there is one in India, who is willing to undertake to procure for them, as much real, good, merchantable cotton, either American or indigenous, as they may require—after the second year, if it be the American,—and immediately, if it be the indigenous, and not to cost them when landed in England, the former, more than about an average of 4 or $4\frac{1}{2}d.$ per lb., and the latter 3 or $3\frac{1}{2}d.$ per lb., which I think very moderate, considering that the American cottons generally realize in England from $4\frac{3}{4}$ to $7\frac{3}{4}d.$ per lb. and the indigenous from $4\frac{1}{2}$ to $5\frac{1}{2}d.$ per lb.

In December 1844, I offered to have 1,000 beegahs of the American cotton cultivated in Bundelkund, *at my own private expence*, to show the Government of the North-western Provinces,—provided, I was supplied with 125 maunds of seed from some of its experimental farms then existing, and removed to Calpec,—the practicability of the successful introduction even of the American cottons. My object was simply to prove at my own cost, the feasibility of the thing, through the agency of the landed proprietors and cultivators of the soil. Had my proposition been patronized, the result of my experiment of 1,000 beegahs, I had sanguine hopes, would have shown not only the uncertainty but the expensiveness of the “*Neej*,” or home cultivation system, unsuc-

cessfully adopted at the Government experimental farms. Unfortunately I could not obtain the seed from any of the Government farms. You must recollect that I afterwards applied through you on the 31st of January 1845, to the Agricultural and Horticultural Society of India for the seed, offering to pay for it, but what was kindly placed by one of its members at the disposal of the Society on my account, proved bad, on trial by the Honorary Secretary. Had I succeeded in my application and obtained the seed, I calculated the first year's cultivation of 1,000 beegahs would have afforded me acclimated seed enough in the succeeding year to cultivate 26,000 beegahs, and in the third year probably sufficient to sow 533,000 beegahs, yielding, I had every reason to expect, a produce of 130,000 bales of cotton, averaging in weight 336 lbs. each. The latter part however of the speculation, namely, that of the 2nd and 3rd year, I could never have thought of embarking upon on my own account.

The success of my first year's adventure, I had no doubt would have induced the Indian mercantile community, through the recommendation of my Calcutta friends, to support the continuance on their account of my two subsequent years' contemplated experiment.

In conclusion, permit me to beg the favor of your endeavouring to procure for me 125 maunds of good American cotton seed, to enable me to commence operations in May and June, 1849. I will be happy to remit to you its amount, as soon as I hear that you will be able to secure the seed for me, at the period I shall require it. I shall of course, *pro bono publico*, keep you informed from time to time of the progress of my cultivation, for insertion in the Transactions of the Agricultural and Horticultural Society of India.

To R. LOWTHER, Esq., Commissioner at Allahabad.

SIR,—I have the honor to acknowledge the receipt of your letters, No. 8 of the 28th ultimo, and No. 9 dated the 6th instant, the first transmitting a copy of one from Mr. Secretary Thornton to the address of the Sudder Board of Revenue, N.W.P., and requesting that I would furnish the information called for respecting the extent to which India is capable of supplying cotton in the event of an increased demand for it: and the second transmitting a copy of the letter No. 75, from the Secretary to the Government of India, Home Department, dated the 15th January last, and of the enclosure which accompanied it, respecting the information required by the Hon'ble the Court of Directors, regarding the quantity of cotton produced in India.

2nd. Having been employed at the late Commercial Residency of Etawah and Calpee, from its first establishment in 1808, till its dissolution with the cession of the Company's trade in 1834; and having, on the abolition of the Residency, been engaged myself extensively for four years subsequently in the purchase of cotton on my own account, as well as on commission for several agency houses in Calcutta; and having been accustomed to form and submit one general estimated average of the cotton intended for consignment to the London and China markets, upon the prices annually prevailing at the several marts in the North-western Provinces, I am humbly of opinion, it would be more to the purpose to reply in the same manner to the queries propounded by the Hon'ble the Court of Directors, than were I merely to confine my information to any one single district or mart.

3rd. I have the honor to annex below, my replies opposite to the queries contained in the dispatch of the Hon'ble the Court of Directors.

I. "What is the price of cotton freed from seed, at the principal mart or marts in your district?" The price depends principally upon the demand and produce. In an average season however, cotton, at the place of produce fit for the London market, may be estimated at Co's. Rs. 7 per maund of 80 Co's. Rs. to the seer, equal to 14 shillings for 80 lbs. The cotton fit for the China market may be estimated at one rupee less per maund.

II. "At what price does the ryut sell his cotton, cleaned or uncleaned, and with or without advances?" The ryut, who can manage his cotton cultivation without the aid of an advance, realizes about 6 rupees a maund of the seer of 96 Co's. Rs. for his clean cotton. The poorer classes of cultivators, however, have little concern with the sale of their cotton. After the seed is sown at the commencement of the periodical rains, they require the aid of the village *bunneeras* or bankers to enable them to weed, and to attend to their cotton and other crops; which, from the time the assistance is granted, become in a manner mortgaged to the *bunneeras*, at least they have the entire disposal of the produce. Owing to this circumstance, the *kuppas*, or cotton with the seed, as it is gathered, is made over to them, who separate the cotton from the seed, and sell it to re-pay themselves. The cultivators in this case seldom realize more than rupees 4 and 8 annas for their maund of clean cotton.

III. "What is the expence of cleaning cotton by the *churka* or foot roller, or by any other method which may be in use?" Properly speaking, the separation of the cotton from the seed in this country costs nothing, whether the work is performed by the cultivator, or the person to whom he sells it unfreed, the price the seed realizes when sold, more than covers the amount of labor.

IV. "What are the expences of conveying cotton to the nearest port for shipment?" Including the expence of cleaning and screwing the cotton, gunnies and other packing

materials, boat-hire, export duty, and every thing else, an average of about Co's. Rs. 2 and 3 annas per maund of 80 Co's. Rs. to the seer, to Calcutta from the place of produce.

V. "What is the average produce of cotton per beegah or acre?" Generally a maund per beegah, of the 96 Co's. Rs. to the seer, or 2 maunds 8 seers the acre, where the cultivation is properly attended to.

VI. "What is the quantity of land under cultivation with cotton and to what extent is it probable that the cultivation could be carried, in the event of an increased demand? N.B. The beegah, maund, and rupee used, in answering these questions must be defined." In the year 1818, the largest quantity of cotton, vide my address to you of the 2nd April, 1846, was exported by sea from Calcutta, viz., near 12,00,000 maunds, we may therefore, I think, safely calculate, upon an equal quantity having been produced and retained in that year, for the consumption of the North-western Provinces as well as Bengal. If my data be tolerably correct, there must have been about 24,00,000 beegahs of land under cotton cultivation in that year. What it may now amount to, must be considerably less, but to what extent it could be carried, in the event of an increased demand, it will not be difficult to tell.

4th. Having replied to the questions in the dispatch of the Hon'ble the Court of Directors, I shall now proceed respectfully to offer a few more general remarks on the same subject, which my experience and recent enquiries of native wholesale dealers in the article, suggest.

5th. You must have observed during the last twelve months, how strenuously the Hon'ble the Court of Directors, the Board of Control, and even the House of Commons have been memorialized, urged, and solicited by the Liverpool, Manchester, Lancashire, Hull and other commercial and manufacturing associations, regarding the increased cultivation of cotton in India.

6th. From the purport of these memorials, as well as the remarks of the press in India, the real merits of the question appear to be wholly misunderstood. I beg leave to observe, that on this side of India, neither the land-tax nor the transit dues are tremendous, as asserted by the Calcutta press; nor do they amount to any thing like 75 per cent. on the average value of cotton, as represented by the *Hull Advertiser*. What they may be at Bombay or Madras I cannot exactly say, but I am inclined to suppose, far from what they have been designated. All the amelioration that would be required, it appears to me, would be to place the Bundelkund cotton, and the produce of the right bank of the Jumna generally, upon the same footing as that of the Doob, namely, to levy the duty on the exportation of the cotton from Calcutta. The evil of making the Bundelkund cotton and that of the right bank of the Jumna, pay the duty before it can be boated, is in fact a tax upon the land under cotton cultivation.

7th. If the associations and manufacturers, who have been memorializing and soliciting the authorities in England, regarding the increased cultivation of cotton in India, actually wish for it, and will guarantee that all that may be produced through my exertions in this country, will be taken by them, and paid for here, and will send out responsible agents to receive charge of the cotton, either here or at Calcutta, I will engage and undertake to produce for them, as much real, good, merchantable cotton as they may require; and not to cost them, when landed in England, more than about $3\frac{1}{2}d.$ per lb., which I think very moderate, considering that Indian cotton generally realizes from $4\frac{1}{2}d.$ to $5\frac{1}{2}d.$ per lb. in England.

8th. The decrease of cultivation everywhere in India, may be ascribed solely to the want of a demand for the article. If the Government, even through the means of advances to the cultivators, increased it, to meet the solicitations of the associations in England, I apprehend, that as soon as those

advances ceased, the culture would again revert to its former standard, owing to the poverty of the landholders and ryots.

9th. If the associations be of opinion, that the indigenous cotton, of a good staple and quality, be desirable at my estimated average of $3\frac{1}{2}d.$ per lb., the most eligible plan, it appears to me would be, to purchase it through the *Beoparries*, or native cotton merchants, as was done before for the Company, when they traded in the article, and to leave the *Beoparries* to get it from the cultivators, as they formerly did, and now do, to the extent of their wants, through the village *bunnees* or bankers. If the native merchants found the speculation advantageous (very little indeed satisfies them), they would, I am sure, take proper measures to encourage the cultivators. By the adoption of this plan, cotton of an uniform good quality may readily be obtained from every part of the North-western Provinces, through the native cotton merchants, without the risk of incurring balances. If the half of the amount of cotton which is now used in England was thus transferred to India, it would not only do the country an immense deal of good, but yield the Government an export duty of 55,00,000 Rupees.

(Signed) J. G. BRUCE, *Deputy Collector.*

CAWNPORE : 15th March, 1848.

Correspondence and Selections. .

RISE AND PROGRESS OF THE BHAUGULPORE BRANCH AGRICULTURAL, HORTICULTURAL, AND FLORICULTURAL SOCIETY.

(Communicated by Major T. E. A. NAPLETON.)

In the early part of April 1843, a suggestion arose as to the expediency of establishing an Agri-Horticultural Society at this station, as the soil and climate appeared particularly adapted for such an undertaking, and with this view a meeting of the residents of Bhaugulpore and its immediate vicinity, both European and native, was convened on the 11th of the same month, for the purpose of ascertaining how far such an object was in unison with the wishes of the public.

The meeting was most numerously attended, and fifty-two subscribers gave their support to the proposed institution.

It was next voted, that a public experimental garden be immediately established, and that a piece of land opposite Cleveland house, of twelve beeghas (which in Mr. Cleveland's lifetime formed part of his splendid estate) be selected and purchased for the purpose. The purchase was very shortly concluded at Rs. 40 per beegha, whilst a crop of indigo was growing on it, and a suitable establishment was entertained for commencing operations and clearing the land. Donations for the purchase of the land were solicited, and the call was responded to with much liberality.

Major T. E. A. Napleton was appointed Honorary Secretary, and he was requested to undertake the laying out and management of the public garden.

It was also decided, that the monthly subscription should be Rs. 1-8-0 or 18 Rupees per annum, and that a donation as entrance money should be left optional with intending subscribers. The following propositions were put and carried *Nem. Con.* That the chief object in forming this institution be for the improvement of agriculture and horticulture in all its branches. That the Agri-

Horticultural Society of India be solicited to enrol or consider us a branch of the Parent Institution.

Several packets of melon, lucerne, coriander, onion, beet, capsicum and clover seeds brought from Cabool by a member of the society were presented to it for the purpose of being sown in the new public garden, and a letter was written to Messrs. Vetch and Co., Exeter, Devonshire, for a fine supply of seeds for the October sowings.

The next step in advance was, the expression of a wish on the part of the subscribers, that an exhibition of flowers, fruits, vegetables, &c. should take place on the 10th of the ensuing month of May, for the purpose of ascertaining what the produce of the gardens at the station consisted of, and what cereal and other grains were grown in this district. The result was, that floriculture was found to be almost in its infancy, with the exception of one or two gardens; the vegetable department was somewhat more advanced, the fruits excellent, but the cereal and other grains of the very poorest description with a very few exceptions, and it is worthy of remark, that some fifty *dallees* from the gardens of the native subscribers consisted wholly of indigenous specimens.

The show was exceedingly well attended, indeed crowded, and the most lively interest appeared to be taken in every thing connected with the object for which the show was held.

The sum of Company's rupees 41 was distributed in prizes.

It was on this occasion decided, that the earliest opportunity be taken of introducing into the district from foreign countries, other districts, Cutmandoo and Darjeeling, seed of cereal grains for the purpose of being acclimated in our public garden, and then distributed to the zumeendars and other agriculturists, and it was, with a view of carrying out such an important measure, resolved, that a piece of ground suitable to agricultural experiments be allotted. Seventeen new subscribers were added to the list during the month of May.

From this period up to the 1st November following, the formation of the public garden was most industriously carried on. The clearing of the ground, levelling it, making serpentine, diagonal, and other walks, sinking wells, the erection of temporary sheds for

the gardeners, and garden implements : the purchase of bullocks, hackeries, &c. Application was made to Dr. Wallich, Superintendent of the Honorable Company's Botanical Gardens for plants, who immediately met our wishes with much liberality, and expressed his willingness to render further assistance whenever required.

On the 15th of November an examination of the accounts of the Society took place in the public garden, prior to an horticultural exhibition the same evening. It was most gratifying to find that the list of subscribers on this day numbered 111, and the amount of donations for the purchase of land, &c. for the public garden 1178 rupees. The districts of Purneah and Monghyr gave their support in the way of subscribers most handsomely.

Dwarkanath Tagore, Esq., visited our garden in September, and gave a donation of one hundred rupees in his usual munificent style of supporting useful institutions.

Two silver medals and the sum of fifty rupees were received from the Parent Society, with an intimation that a similar donation would be presented annually to our Branch Society.

Now come the receipts and disbursements.

Memorandum.

Amount of monthly subscriptions to the			
30th of November, 1844,	..	..	1,159 0 0
Amount of donations up to the 30th of			
November, 1844,	..	..	1,175 0 0
Total, Co's. Rs.			
	..	..	2,334 0 0
Expenditure up to the 1st of Nov. 1843;			
	..	..	2,255 0 0
<hr/>			
Balance in favor of the institution on the			
1st November 1843,	..	..	79 0 0

G. F. Brown, Esq., was the Chairman at this Meeting. The accounts were approved of and passed.

It was then proposed by E. F. Reade, Esq., Civil Service, and seconded by Dr. Leckie, that the thanks of the meeting be offered to the Honorary Secretary for his indefatigable exertions in planning and laying out the garden, and bringing it into its present flourishing condition.

The Honorary Secretary gave notice that the extra sum of two hundred rupees was much required for the completion of work in hand, upon which the Chairman addressed the meeting in the following words :—

“ GENTLEMEN,—Though it may not be considered quite regular for the Chairman of a public meeting to move any resolution for general adoption, yet I hope you will hold me excused for doing so on the present occasion. You have just passed a vote of well merited thanks on our indefatigable Secretary, but I wish you to do something more than this : I wish you to prove by deeds, not words, how grateful you feel for his meritorious exertions.

“ You all know that a year ago, such a society as this was never thought of at Bhaugulpore, and that six months ago, our present flourishing public garden was an indigo field.

“ Within this short period, the ground has been purchased and cleared, walks have been made, wells dug, show-rooms built, trees planted, flowers of all descriptions brought from Calcutta, potatoes from Futtighur, cotton from the east, tobacco from the west, and all sorts of varied and valuable seeds from England. For all this, I tell you again and again, we are indebted to Major Napleton.

“ But more than this. We owe it to Major Napleton’s zeal, constant supervision, and good management, that twice as much has been effected with the money which we subscribed towards the undertaking than we could reasonably have expected. He has made rupees 500 go as far as another would have done rupees 1,000. Now then, as it appears that some little matters are wanted in order to complete the object which Major Napleton has in view, I think that we cannot better show our gratitude to him for his valuable services than by making up the small sum required for the purpose. A few rupees from each subscriber will be sufficient, and will be the best proof we can give of our rightly appreciating Major Napleton’s successful exertions.”

The sum asked for was at once subscribed.

It is proper to note, that a supply of very fresh seeds was received per overland route during the month of November, from Vetch and Co., of Exeter.

The meeting then broke up, and those who composed it proceeded to the show-rooms, where the ladies of the station and a great number of visitors were assembled.

The show-room presented a very pretty appearance, and the samples of vegetables and bouquets of flowers for this early part of the season were very creditable.

The silver creeper and *Yucca gloriosa* were in great beauty, and the *Hastingsia* in company with them, formed a beautiful contrast of colors. The first and third are indigenous to the jungles near this.

It was truly pleasing to see the native subscribers, their children and friends who accompanied them, taking their seats to witness the competition for prizes. At first they were reluctant in sitting down before the *sahib log*, but on being assured that they were assembled to do honor to, and promote the cause of agriculture and horticulture, and from the circumstance of their being fellow-contributors to the garden in which they then were, their scruples were overcome. Several of the gentlemen entered into conversation with them, and pointed out the ulterior benefits likely to accrue from Agri-Horticultural exhibitions of this nature. It would take up too much space to go into a detail of the products brought forward for competition; suffice it to add, that 46 rupees were awarded in prizes.

Thus ended the first show in our public garden.

Another show took place on the 28th December, and continued improvements in all departments were evident, and the sum of 40 rupees was awarded in prizes.

At the commencement of a new year it is but natural that this Branch Society should say a few words in allusion to the past one. On New Year's Day no less than 116 subscribers were borne on the rolls, and the money donations amounted to rupees 1,489.

The projectors of the institution cannot refrain from recording the satisfaction they have derived from the great support they have received from the European and Native community, and it would be ungrateful to omit the mention of the names of the following gentlemen as contributors of plants, seeds, &c.

Dr. Wallich; Dr. Griffith; G. W. Bartlett, Esq.; Dr. Campbell, Superintendent of Darjeeling; Dr. Pearson; G. F. Brown, Esq.;

J. Pontet, Esq. ; Muddun Tackoor ; W. Vansittart, Esq. ; Capt. Don ; Walter Landale, Esq. ; C. H. Barnes, Esq. ; R. F. Hodgson, Esq. ; G. W. Brown, Esq. ; Major Napleton ; E. Lautour, Esq. ; J. Piron, Esq. ; J. Glas, Esq. ; J. Oman, Esq. ; J. H. Savi, Esq.

On the 3rd of February 1844, another exhibition of vegetables took place, at which an immense assemblage of subscribers and visitors were present.

The show-room was full of *dullees*. From the gardens of European subscribers, English vegetables of all sorts were to be seen. Cauliflowers from English seed, 46 inches in circumference, celery, cabbages and nohl-kohl of sorts, carrots, beet-root, peas of sorts, salad, &c. &c., and it is worthy of notice, that numbers of *dullees* brought from the gardens of the Natives contained fine specimens of English vegetables.

It was on this occasion decided, that as the *rubbee* crop would be harvested by the first week in May, an exhibition of agricultural produce be fixed for the 7th of that month, when two silver medals and some prizes in money would be contended for. The show came off accordingly on the 7th May. About 70 members, besides visitors, attended, and the samples of grain covered 20 large tables.

The umpires, G. F. Brown, G. W. Battye, P. Onraet, Esqrs., Baboo Gooroo Churn Mitter and Muddun Tackoor, after a careful examination of the specimens, awarded a silver medal to C. H. Barnes, Esq., of Colgong, for the finest samples of wheat and barley. A second medal was awarded to Major Napleton for the best potatoes, tobacco, white gram, &c., the honor of receiving which he declined in favor of the native zumeendars, and it was accordingly awarded to Rajah Oodit Narain Sing, of Aulumnuggur, for the best sample of oats and 2nd best wheat. A money prize of 6 rupees was awarded to Muddun Tackoor, Zumeendar of Kulan, for some excellent samples of wheat and barley. A money prize of 3 rupees was awarded to Muhasha Omanaath Ghose for mangul wurzul.

The cultivation of the potatoe has been carried on with immense success during the last six months. Four potatoes reared from Cherra Poonjee sted weighed 77 rupees : five potatoes from Darjeeling seed weighed 80 rupees. The introduction of mangul wurzul into the district will no doubt (when the natives become fully sensible of

its value as an article of food for their cows and cattle,) be highly appreciated.

It is not the wish or intention of the present Garden Committee (under whose auspices this report of the Bhangulpore Branch Society's progress from year to year, is preparing) to enter too much into detail, but to notice eventful occurrences, and such as may prove agreeable in their perusal to those who take an interest in the subject, which these few pages occupy in the Journal of the Agri-Horticultural Society of India; and be it not supposed for a moment, that we should have brought the affairs of our institution thus prominently to public notice had not the Parent Society done us the honor to express a wish to see the result of our humble endeavours committed to paper.

A meeting for the inspection of accounts, &c., was held in July, 1844, which found our Branch Society free from debt, notwithstanding the expensive operations which must necessarily attend the formation of a new garden, a garden too, which is eventually intended to be a botanical one.

On the 19th of November of the same year, a horticultural exhibition took place.

Every improvement that could be described in the floricultural and vegetable departments was developed in the mass of beautiful specimens brought to the show-rooms. It is proper here to note, that the products of the public garden are not allowed to compete for prizes, but on this occasion the improvements in the baskets of vegetables and bouquets of flowers were so satisfactory, that the unpires voted that a handsome present should be given to the Society's gardeners as an encouragement to still greater exertions.

The sum of money required was subscribed for at once and given to the *malees*.

We must now close the year 1844, with the following brief remarks:

Nine beeghas of ground were added to the public garden, and a tank of fine size commenced on; which, being bounded on the north by the public road leading from Monghyr to Calcutta, will eventually furnish a fine supply of water for travellers, besides being a great ornament to the public garden. The Magistrate Mr. E. Lautour,

seeing the vast deal of public good which would accrue from the completion of such a tank, most kindly gave convicts to assist in excavating it, attended himself frequently, and marked out its limits. The European and Native community subscribed very handsomely (some 500 rupees) to this undertaking, and the Superintendent of Police assisted us with 200 rupees also.

Two *ghats* were constructed with 28 pukka steps to each, and before the year closed all was finished.

The number of subscribers on the roll on the 31st December was 156.

It is with the greatest pleasure we now make known, that the Hon'ble Sir L. Peel, the great and liberal patron of Agriculture and Horticulture, became a subscriber to our Branch Society, during the year 1844, not on 18 rupees per annum, the regulated subscription of the institution, but on the munificent sum of one hundred rupees a year. From the Parent Society we received six sorts of American maize seeds, Cuba and Bhilsa tobacco seed, two cases of English fruit trees, Nerbudda wheat and white linseed, a fine supply of vegetable seeds, with two silver medals and 50 rupees. Also plants and seeds from Drs. Griffith and Wallich, Superintendents Hon'ble Company's Botanical Gardens, The Hon'ble Sir L. Peel, the late C. K. Robison, Esq., the Messrs. Wood, Dr. Campbell, Superintendent of Darjeeling, G. W. Bartlett, Esq., Captain Hockly, Syud Zain Ooddeen Hoossein Khan, the Hon'ble Sir G. Pollock, A. Parker, Esq., and Dr. Christie, Kutmandoo. Can we do less than express our grateful acknowledgments to our subscribers and donors for thus liberally supporting our institution? and, under such cheering prospects, it is not unreasonable to predict, that the eventual success of the undertaking may, in some measure, compensate them for their able support.

Now commences the account of our progress in 1845.

Agri-Horticultural exhibitions took place on the 16th of January, the 12th of April, the 30th of May, and 15th of November. The most remarkable events in this year are as follows :

The addition of thirteen beeghas of land to our public garden, the erection of several buildings, the lengthening of the tank 80 feet, and the construction of a beautiful ghat on stone pillars to the eastward, which James Young, Esq., our Magistrate, designed with great good

taste, and in all these improvements assisted us with convict labor, until an order from Government interdicted prisoners being employed in public gardens.

In the floricultural, vegetable, fruit and agricultural departments, the continued improvements were highly commendatory, particularly in the introduction of many new varieties of cereal grains, flowers and vegetables. Our subscribers at the close of the year numbered 210.

Rajahs Bejagobind Sing and Roodranund Sing Bahadoor, presented our Branch Society with 100 rupees cash, on becoming members. The sum of 113 rupees 6 annas was realized by the sale of vegetables, and the accounts being examined at a public meeting on the 14th November of this year, a balance in favor of the institution of 416 rupees was exhibited, which was pronounced very satisfactory. The Honorary Secretary at the same time reported, that the seeds received for this season's sowings had not turned out well in consequence of having been stowed by our London Agent in a bad part of the hold of the ship which brought them out. From the great heat of the hold the seed had sweated and caked.

Two silver medals were in May awarded as follows :—

One medal to George Barnes, Esq., Colgong, for some very fine specimens of wheat, white gram, barley and oats. The samples were the produce of the Ekdara and Colgong zumeendarees conjointly.

The second medal was awarded to Rajah Oodit Narain Sing, of Aulumnuggur, for the best white linseed, American cotton, oats, &c. It is worthy of record here, that two of the zumeendars of Tirhoot sent samples of cereal grains to the show. In the agricultural department some money donations were presented to three native agriculturists, for fine samples of potatoes, cotton, safflower, peas, tobacco, &c. &c.

We cannot close this year without noticing the great additional number of subscribers from the Tirhoot, Rungpore, Gyah, Goruckpore, Beerbhoom and Bhaugulpore districts, and in taking leave of it we sincerely thank our supporters for their liberal aid in forwarding the interests and welfare of our Branch Society.

The first occurrence in the year 1846 we have to notice is an exhibition of vegetables, fruits, flowers, &c. on the 30th of January.

This was the finest show hitherto seen in our public garden, and room for the vegetable *dallees* not being available in the show-rooms, they were laid out under a mangoe grove close by. The floricultural specimens were arranged with taste in the show-rooms, as also the fruit.

The following opinion of the umpires relative to the produce of the public garden will show at once what improvement had taken place since last year :

“We are of opinion, that the show of vegetables and flowers exhibited this day in the public garden, excelled, it is believed, any thing of the kind ever seen in India, and would vie with the best productions of Covent Garden in point of size and quality, as will be proved by the weight of the articles specified below, reflecting the greatest credit on Major Napleton, the Honorary Secretary, for his zeal and skill in producing such a magnificent show of first-rate vegetables, flowers and exotics, from what was a short time since a common indigo field.

“The taste and skill also displayed in laying out the garden, and the fine order in which it is kept, is beyond all praise, and excited the admiration of thousands assembled to view it.

“It is hoped that this laudable example will be followed at every station in India.”

(Signed) C. B. QUINTIN.

(Signed) J. MACCALLUM.

„ R. BARNES.

„ F. GOULDSBURY.

Memorandum showing the weight (eighty Siccas to the seer) of some of the public garden vegetables.

Celery.—One stick weighed 3 lbs. 10 ounces, and was finely blanched: another stick weighed 2 lbs. 10 ounces, and was finely blanched.

The oldest residents in India present at the show, were unanimous in declaring the celery exhibited to be far the finest ever seen by them in India, and perhaps never surpassed in Europe.

Beet-root.—Two pieces of beet-root weighed 4 lbs. 10 ounces.

Potatoes.—Four potatoes from Cherra Poonjee seed weighed 3 lbs. and it has been most satisfactorily ascertained that the Cherra potatoe

is superior in flavour and more productive than any other grown in India, with exception of the Darjeeling, which after being acclimated at Bhaugulpore, is a wonderfully good potatoe, with a skin as fine as silk, and in color delicately white.

Onions.—Four Onions from acclimated Cabool seed weighed 3lbs. and 5 ounces, and were beautifully white in color.

The *dallees* from private gardens of the European and Native community were of a very superior description.

Some splendid exotics were to be seen amongst the flowers from the garden of R. F. Hodgson, Esq., of Monghyr. Prizes to the amount of 5½ rupees 12 annas were awarded. The concourse of respectable Natives in attendance at this show was enormous, not less than four thousand.* The umpires awarded a month's pay to each of the sirdar mallees.

Floricultural department,	..	..	..	7	0	0
Vegetable department,	..	..	..	6	0	0
Agricultural department,	..	..	..	6	0	0

The next thing worthy of notice in this year is the introduction into the public garden of the West India arrow-root. Dr. Stuart of Kunjarpore, most obligingly presented the Society with a lot of roots or tubers, and their cultivation was commenced with much care at the commencement of the rainy season, and yielded a fine crop in the cold weather. Swampy ground was fixed on for the experiment, and the result fully taught us that we had not erred in doing so. We shall refer to this subject again by and bye.

The grafting of mangoes on seedlings from the finest Bombay trees was carried on with great success this year; the parent trees, 45 in number, having become available for the above purpose in an orchard on the Cleveland house gardens. *Leechee untas* were also made: loquats grown from seed: coffee plants planted out, and in the account of the last year we omitted to mention the introduction of a fruit tree into the garden called the sapota.

The Rajas and Zumeendars in these districts think no garden perfect or complete that has not this fruit tree in it. The foliage is

* Exclusive of children, gardeners, servants and the like.

very pretty and ornamental. The fruit itself round, and brown in color, and nice tasted, and would form a handsome desert fruit. The above description of the fruit was given us by Maharajah Bedanund Sing Bahadoor, of Purneah.

In June our agricultural exhibition took place, and it was most gratifying to see realized the looked-for improvement in cereal and other grains, &c.

The Nerbudda wheat, white linseed and white gram, attracted much notice. The former has been extensively cultivated in farms far and near. Walter Landale, Esq., of Luttypore, an enterprising agriculturist, imported 50 muns of Nerbudda wheat at the last sowing season (October), and distributed no small portion of it. The produce of that gentleman's farm ranked No. 1 in the show, which circumstance it is hoped proved some reward for his zeal in so good a cause. Finer wheat could not, it is believed, be met with in any country. The awarding of medals however, depended on the greatest number of best samples (not one sample) of all sorts of grain from one farm, and the umpires after testing all, most carefully decided that Rajah Oodit Narain Sing, of Aulumnuggur, was entitled to a silver medal for two best samples of wheat, one of barley, one of oats, one of white gram, one of safflower, and one of tobacco.

This medal was open to the competition of Europeans and Natives, and the winner of it just named, when the medal was delivered to him, was complimented on his success. A second medal which was open to the competition of Natives only was won by Baboo Gooroo Churn Mitter, of Bhaugulpore, who has ever taken the greatest interest in every thing tending to improve the condition of his countrymen, and is much respected by all who know him. His name will be familiar to many who peruse these few pages, not only as a cultivator of the soil, but of the mind, for he is the head-master of, it is believed, one of the most flourishing English Mofussil Schools in India, and it redounds much to his credit that a portion of his leisure hours should be thus usefully employed.

A money prize was most properly awarded to Walter Landale, Esq., for his superb Nerbudda wheat, and a similar one to George Barnes, Esq., of Colgong, for white linseed. We must not omit to mention that a very fine basket of Nerbudda wheat was brought

from the farm of John Oman, Esq., of Colgong, and a sample of white linseed grown by F. Greenwood, Esq.* Two of our Tirhoot native subscribers sent musters of cereal grains, &c., to this exhibition, and although they did not win prizes, the samples were very creditable to their farms. They, however, carried off a prize each for leeches in the fruit show. Their names are Baboo Gobind Suhaee and Baboo Bridjbeharee Loll, of Mozuffarpore.

A fruit and flower show took place on the same evening. There were some beautiful bouquets of flowers to be seen, and one of exotics from the garden of J. Pontet, Esq., was deservedly admired. A remarkably fine show of grapes, peaches, Bombay mangoes, Maza-gong mangoes, Rungpore plums, leeches, plantains, &c., were to be seen on the show tables, besides which, some very fine asparagus, Cherra Poonjee and other potatoes, and mangul wurzul of an enormous size, and in a most healthy condition. Several prizes were awarded.

In November a vegetable and flower show was held. In the former, early cauliflowers, early potatoes from Cherra Poonjee seed, vegetable marrow, and all other English vegetables were to be seen in great perfection, and in the latter a fine display of flowers. Prizes to the amount of 40 rupees were awarded.

In closing our account of the year 1846, we must not forget to mention, that a new seed and show-room, 46 feet long by 22 broad, with an 8 feet verandah all round, was built: another mallees' house, 32 by 18, and carriage drives through the public garden commenced on. We received the names of a great number of new subscribers from Tirhoot this year, also from Monghyr, Chupprah, Gyah, &c. &c., also a donation of one hundred rupees from H. V. Hathorn, Esq., Civil Service, Chupprah, and the sum of one hundred rupees from Robert Lowther, Esq., Civil Service, Allahabad, who has compounded for his subscription.

The donations of plants, seeds and the like were most numerous, and we must thankfully acknowledge all these kind presents.

Now commences 1847. There was a remarkably fine vegetable show in January. The following memorandum of the weight of a

* Was sent by that gentleman from Monghyr.

few of them will be quite sufficient to allow our readers to judge of the progress in that department of our public garden :

1 Stick of celery,	..	..	..	3½ lbs.
1 Ditto ditto,	..	..	..	2 lbs.
1 Ditto ditto,	..	..	..	2 lbs.
1 Ditto ditto,	..	..	..	2 lbs.

Drumhead Cabbage.—1 weighed 12 lbs., 1 weighed 8 lbs.

Red Cabbage.—1 weighed 5 lbs.

Beet-root.—3 pieces weighed 6 lbs.

Acclimated Cabool Onion.—3 onions weighed 4 lbs.

Acclimated Cherra Poonjee Potatoes.—12 potatoes weighed 5 lbs.

1 radish (Spanish) weighed 8 lbs.

2 vegetable marrow weighed 10 lbs.

A basket of artichokes, some of which measured 14 inches in circumference each.

The *dallees* from private gardens were unusually fine, and the competition for prizes great.

The floricultural department was very gay, and independent of the specimens from private gardens, there were some 25 bouquets of beautiful flowers, the produce of our public garden.

The profusion of roses of seven varieties, from Cleveland house garden, was greatly admired.

On the 26th of March, our Branch Society was fortunate enough to obtain the services of Mr. Robert Ross, an excellent botanist and practical gardener in all its branches, and it is believed that the readers of these pages cannot be better informed in regard to the state in which he found our public garden, than by perusing the following letter from Mr. Ross, to our Honorary Secretary :—

SIR,—On taking charge of the public garden last March, I was surprised to find the high state of perfection it was in, considering the short period that has elapsed since its formation. The variety of fruits, flowers, vegetables, &c., it contains, is considerable, and to enumerate all would take up some time. I am sorry I did not see it at a more favorable season of the year, when its various productions were in their prime. I have however seen enough to convince me, that a better site could not have been chosen for a public garden

than that you have selected, both for the ripening of seeds and the growth of plants, not only from tropical, but temperate climates. My more 'than five years' experience as head gardener of the Hon'ble Company's Botanical Garden, Calcutta, enables me to say something of gardening in India.

2. Here I have met with some plants from Tropical America that produce seeds that we could never get a single seed from in the Hon'ble C. B. G. Calcutta. This I think speaks well for the soil or climate, or the treatment you have given them, or perhaps all united.

3. Some of the vegetables, &c., from which you have saved seed, I here enumerate.

Globe artichoke, asparagus, turnip, carrot, beans 3 sorts, peas, lettuce, endive, celery, beet-root, radish, Guinea-grass, cress, trefoil, cauliflower, lucerne, &c.

4. The large quantity of seed you have saved from most of the above, with many other species of seeds, I might mention such as English, Cape, and American flower seeds, &c., is of the very best description; as a proof of its being really good, I may observe that the ground where some of it was produced, is literally filled with self-sown seedlings, and this too at this unfavorable season of the year, and where they have simply had the benefit of a recent shower of rain.

5. Your plantations of globe artichokes, are as fine as any I have ever seen at home: to give some idea of their magnitude, some I find, and not a few, measure 15 inches in circumference, and average from 12 to 14 inches. I have no doubt many of them were much larger had I seen them in the proper season, and before any were cut for table.

6. Your fine asparagus is more like the English in flavour than any I have tasted in India, and a month hence, when this fine vegetable will be in its prime, I shall be able to report more fully on it.

7. Some of your fine healthy fruit trees I here enumerate.

Litchi.	Apricots.
Pears.	Plums.
Loquats.	Desert figs from England.
Bombay, Maldah and other mangoes.	Custard apple.
Strawberry and other guavas.	Sour-sops.
Sapotas.	Shaddocks.
Alligator pear.	Madras and other citrons.
Apples.	Vines.
	Peaches.

and other fruit trees, most of which are large enough to admit of propagating largely.

8. I have never seen fruit trees in better health, some of the peach trees measure 36 feet in circumference, that is, to the extreme ends of the branches or the area of the ground each tree occupies, and all in a full bearing stock average from 25 to 30 feet. The crops of peaches on some of the trees are good, indeed we have been obliged to thin them frequently: some of the fruit measures 8 inches in circumference, though they have not yet reached their full growth.

9. Some of the apple trees are now in flower, and likely to produce fruit this season, and some of the pear trees promise to flower next season: on one pear tree I observe some shoots of last season's growth, 7 feet in length. I mention this that some idea may be formed of the soil and climate of this station.

10. Your extensive vinery of 250 feet in length, with an east and west aspect, both of which are planted with thriving vines of sorts, and some of the vines though young, have now a fair crop of healthy fruit. They were just coming into flower when I took charge last March, and now (May 5) the fruit on some 40 or 50 bunches, about one-third of the present crop, average one-half inch in circumference, though little more than half matured.

11. The coffee plantation now of three years' growth, is in a very healthy state, and many of the plants are now flowering, and give fair promise of yielding good produce. The Assam tea plants presented by Mr. R. Fulton to the Society are healthy. The 400 coffee and tea plants lately presented by Colonel Ouseley are full of health, and when planted out will no doubt thrive well.

12. The fruit and flower plants in the distribution nursery put me in mind of the Honorable Company's Botanic Garden, Calcutta, where I spent so many years, and if your garden progresses, as it has done since its formation, it will, as a Botanical Garden, (your garden is, strictly speaking, a Botanic Garden,) be second to none in India shortly.

13. Your potatoes are of the very best description, both in size and flavor, and I have no doubt the few you recently dispatched to England by the overland route, will be much valued, as they will be a change of seed. I may also mention your extensive plantations

of American maize, West India arrow-root, Jerusalem artichokes, plantains, &c. Your Nerbudda wheat, white linseed, flax and other crops, were nearly all harvested before I arrived.

14. You have many valuable specimens in your garden from South Africa, Tropical America, New Holland, Japan and other quarters.

15. I should not pass over your extensive variety of native vegetables, vegetable marrow, pumpkins, cucumbers, melons, aromatic plants, &c. &c.

16. Your neatly arranged seed-house contains no less than about 800 hermetically sealed quart bottles of agricultural, horticultural and floricultural acclimated seeds of the very best description, and you must have labored hard, single-handed as you were, to have brought your public garden and seed-house into such an efficient state in such short time. The acclimated seeds you have now in store are worth several thousand rupees.

17. Since I have seen what your garden is capable of producing under your superintendence, the knowledge of which you must have acquired from your own observation in this climate, (as English authors on agriculture, horticulture or floriculture are of no use in an Indian climate,) I have been thinking that such a garden as your public garden now is, just what the Agricultural and Horticultural Society of India ought to have. It must cost that Society a large sum annually for imported vegetable and other seeds, but with a garden like this, they might have all or nearly all within themselves.

18. In conclusion I beg to inform you, that several hundred Bombay and Maldah mangoe grafts, litchi, peach, rose-apple, English fig, and many others, are now preparing for distribution, and on the 1st September next I expect to strike some fifteen or twenty thousand cuttings of flowers and shrubs, and many of great variety and beauty.

(Signed) **ROBERT ROSS,**
Head Gardener.

May 8th, 1847.

On the 25th of May, an exhibition of Agri-Horticultural produce took place in the Society's public garden.

The cereal and other grains were first inspected.

There were several baskets of very superior Nerbudda wheat, white linseed, Cuba tobacco, flax, oats, American maize, besides a great many samples of indigenous wheat, barley, gram, safflower, pulse, &c. A medal was awarded to E. F. Lautour, Esq., Civil Service, Gyah, for two splendid samples of Scotch barley and white linseed, also for fine musters of Nerbudda wheat, American maize, &c. Mr. P. Onraet's Nerbudda wheat ranked No. 1 in the show, for which a money prize was given.

Another to Rajah Oodit Narain Sing, for the best tobacco and a sample of unusually fine gram, and a third to Mudden Tackoor, Zumeendar of Kulan, for No. 1 American maize.

In the fruit department grapes, leeches, peaches, plums, were the chief.

In the vegetable department asparagus, four sorts of potatoes, and vegetable marrow were best worthy of notice.

The sum of eight rupees was awarded to the gardener of G. Drummond, Esq., of Peergunge, Purneah, for a basket of remarkably fine peaches. Mr. Drummond's gardener also carried off prizes of some magnificent Cabool onions and Darjeeling potatoes, and we congratulate Mr. Drummond on the great success which has attended his efforts to get good produce from such a notoriously poor and bad soil as that of the Purneah district generally. It is much to be hoped that Mr. Drummond may win a medal at our grand show in May 1848.

On the 2nd of December another show was held, and hundreds of baskets of vegetables, all reared from English seed, were to be seen in the show-rooms. There was a new sort of cabbage called the nonpareil, splendid cauliflowers, peas of sorts in abundance, and the sugar-pea, a new and superb variety, attracted much attention.

The sum of seventy-four rupees and eight annas was awarded in prizes.

In closing this year we must note, that the Honorable Sir L. Peel ; The Honorable Sir T. H. Maddock ; Colonel Ouseley, of Chota Nagpore ; Major Thoresby, Cutmandoo ; Dr. Campbell, Darjeeling ; John Hamilton, Esq., of Calcutta ; Melmouth Hall, Esq., Lehrach, Goruckpore ; Robert Lowther, Esq., Civil Service, Allahabad ; L.

Manly, Esq., of Calcutta ; Edward Lautour, Esq., Civil Service ; F. Harley, Esq. ; were our chief donors in plants and seeds.

We have great pleasure in notifying, that since Mr. Robert Ross' arrival in March last, immense improvements have been carried out, and that besides *many thousand* flower plants having been distributed since November last, thousands more are ready. The great success in raising seedlings from English seed in particular is worthy of record, scarcely in any one instance has a failure taken place : 450 of the finest Bombay mangoe grafts have been prepared under Mr. Ross' own immediate superintendence, about 200 leechewantas, and hundreds of peach, coffee and tea seedlings raised from seed.

The striking of cuttings of the *Bugginwillæa spectabilis*, scarlet and other *Verbenas*, *Banisteria laurifolia*, *Euphorbia jacquiniiflora*, roses of eleven varieties, *Salvia splendens*, *Asystasia formosa*, *Plumbagoes*, *Passifloræ*, *cum multis aliis*, are going on also most successfully, and in every department of the garden grand improvements are taking place. A neat bungalow, consisting of two rooms and a verandah all round, has been built for Mr. Ross, with suitable out-houses : several new wells have been sunk and carriage drives, some seven in number, completed.

The gardeners are mustered by Mr. Ross early every morning, and work for the day apportioned to all, and in taking leave of the year 1847, we have every reason to be thankful for all that has been stated, together with an encreasing list of subscribers.

The monthly expences of the garden are now about 350 rupees per mensem, exclusive of seeds, &c. &c.

Now for the year 1848. A show was held on the 11th of February, and this is the last we shall have to notice in these pages for the present. It is highly satisfactory to notify, that the show-room and its long verandahs were filled to excess with baskets of most excellent vegetables, and it was the opinion of all assembled, that such a satisfactory exhibition had never before been witnessed in India, and seldom perhaps surpassed in England.

The Bombay, Darjeeling, Cherra Poonjee, and other sorts of potatoes, and all quite free from disease, were indeed worth looking at : 40 potatoes from Cleveland house garden weighed 20 lbs.

In the floricultural department there were many new and rare flowers introduced to notice.

A splendid bouquet of the *Bugginvilleæ spectabilis* and *Banisteria laurifolia*, were deservedly admired. The *Pansies*, double violet, double stock of rich colors, double tuberose, and two superb plants of the *Euphorbia jacquiniiflora* in fine blossom, and a great variety of beautiful annuals ornamented the show tables.

In advertence to our West India arrow-root crop we are happy to say, that 150 bottles, each containing 24 ounces of the powder, have been manufactured, and the following certificate will show those who desire to know further about it, how far it can be recommended :

“Certified, that we have examined a specimen of arrow-root prepared from the *Maranta arundinacea*, the growth of the Bhaugulpore public garden, that it appears to us to possess all the nutritious properties of the best West India varieties, and that on account of the care bestowed on its preparation and its consequent purity, we can strongly recommend it as equal, if not superior, to the best kinds procurable in this country.”

(Signed) A. GRANT, *Civil Assist. Surgeon.*

„ H. DRAPER, *Assist. Surgeon, Hill Rangers.*

Our fruit trees and vinery are in a most flourishing condition : at this moment (the 22nd of March), some of the peach trees have fruit nearly full grown on them.

Our young Bombay mangoe trees (grafts) have plenty of fine fruit on them, but only half a dozen mangoes will be allowed to remain on each. Whilst on this subject, we cannot do better than allude to the great benefit of grafting, if the operation be skilfully performed. Grafts made last August, came into blossom in the public garden at the same time the parent trees from which the grafts were obtained in Cleveland house orchard did, and fruit has actually formed on them, but will not of course be allowed to remain.

The grafting of loquats is not so much required, for the seedling trees give very fine fruit at the age of three years, and many of that age are to be seen in full bearing in our garden at this moment, whereas mangoe seedlings take 10 years before they bear fruit largely.

Our *rubbee* experimental crops are remarkably fine, particularly the Nerbudda wheat and Cutmandoo barley, which is first-rate. Lucerne and trefoil occupy a place in the agricultural department, also flax, English oats, barley and wheat, white gram, white and red linseed—and in May next there will be a grand agricultural exhibition, at which three medals will be competed for.

We cannot close this better than by giving in Appendix A.* a list of the present subscribers to our Branch Society, and in Appendix B.* a list of money donations since the formation of the Society, and we now beg to assure the Parent Society, how much we feel their kindness in the unceasing and lively interest they continue to evince on all occasions to this Branch of the Parent Tree.

With the handsome support we are receiving from nearly 300 subscribers, and the good wishes we believe of a great many non-subscribers, it would be hard indeed, if our progress were impeded. We hope on the contrary, that the great care and unceasing exertions which are bestowed on every thing connected with its “going a head,” will be an earnest for its ultimate success in carrying out the grand object for which it was formed, viz. the improvement of agriculture, horticulture, and floriculture in all their respective branches.

To those gentlemen, who first acted as Honorary Joint Secretaries to our Institution, and on leaving their stations relinquished that duty, we first desire to offer our best thanks for the great assistance rendered by them. T. C. Trotter, Esq., of the Civil Service, was wonderfully successful in the district of Tirhoot in every thing which could advance the interests of our Branch Society. The number of our subscribers in that district is very large, indeed the greatest liberality has been manifested by the Civil and Military Services, and our excellent friends the Planters.

* We regret our inability to find room for these Appendices; but it may suffice to mention, that Appendix A. shows a list of 288 subscribers from 1843, when the Society was formed, to March 1848; of whom 259 pay Rs. 1-8 per mensem, and 29 at the rate of twelve annas per mensem. Appendix B. gives a list of donations in money, for the same period, amounting to Rs. 2,428.—Eds.

To G. L. Martin, Esq., Civil Service, Purneah ; R. F. Hodgson, Esq., Monghyr ; G. W. Brown, Esq., Purneah ; E. F. Lautour, Esq., Gyah ; Dr. Irvine, Patna ; Captain Milne, Ghazee-pore ; we feel very much indebted for their valuable aid.

To our present Honorary Joint Secretaries, the Honorable F. Drummond, Civil Service, of Purneah ; W. Travers, Esq., Civil Service, Monghyr ; Dr. Denham, Gyah ; J. F. Lynch, Esq., of Mozuffur-pore ; R. King, Esq., of Patna ; T. Wyatt, Esq., Civil Service, Rung-pore ; C. Steer, Esq., Civil Service, Dinagepore ; R. C. Raikes, Esq. ; Thomas Griffin, Esq., of Buxar ; and last though not least, Walter Landale, Esq., of Luttypore ; the best thanks of our Society are with much pleasure accorded for the great help they are affording us in their respective districts.

We had nearly forgotten to mention that about 600 rupees worth of flower and vegetable seeds are expected in May from the Cape, from Mr. Upjohn, which, with the immense assortment of acclimated seeds now in our seed-room, will ensure it is hoped, an ample supply to all our subscribers. Plants, shrubs, grafts, &c., (some twenty thousand) will be ready for distribution in the early part of November, and as we have a good many left of last year's stock, we are always ready to comply with an indent from stations which are only approachable by water in the rainy season.

In conclusion we annex a Memorandum of Receipts and Disbursements for 29 months, in full, up to the 31st December, 1847, showing a balance in favor of the Society on that day, of 707-14-1½.

By order of the Garden Committee,

T. E. A. NAPLETON,

Honorary Secretary.

The Honorary Secretary in Account Current with the Bhaugulpore Branch Agri-Horticultural and Floricultural Society, from the 1st of August 1845, to the 31st December 1847, being 29 Months.

<i>Cr.</i>		<i>Dr.</i>	
Balance in favor of the Society on the 31st of August, 1845,	416 0 4½	Total expended from the 1st of August 1845, to the 31st of December 1847,	10,032 3 9
Amount of Money Donations received since the 1st of August 1845, to the 22nd of March 1848,	352 5 0	Balance in favor of the Society on the 31st December 1847,	707 14 1½
Amount realized by vegetable daltees,	365 4 6		
Received from the Parent Society, with two silver medals for 1846,	50 0 0		
Received from the Parent Society, with two silver medals for 1847,	50 0 0		
* Amount of Subscriptions from the 1st of August 1845, to the 31st of December 1847, ..	9,496 8 0		
Money realized by sale of tamarinds for 1846 and 1847,	10 0 0		
Total Company's Rupees,	10,740 1 10½	Grand total Company's Rupees,	10,740 1 10½

* Nearly a third of this sum has not been yet received, but is under collection, and may be expected shortly from the Honorary Secretaries of the districts in arrears.

E. E.

T. E. A. NAPLETON,
Honorary Secretary.

REPORT OF EXHIBITIONS OF VEGETABLES, FRUITS, FLOWERS
AND AGRICULTURAL PRODUCE, HELD AT BHAUGULPORE, ON
11TH FEBRUARY AND 25TH MAY, 1848.

(Communicated by Major NAPLETON, Honorary Secretary Branch Agri-
Horticultural Society.)

On Friday, the 11th of February 1848, an exhibition of flowers and vegetables took place in the Society's Botanical Garden, at 4 o'clock in the evening, where upwards of a hundred members of this our Branch Society were in attendance, besides a great many visitors. The show-room and its verandahs were quite full of *dalees*, and the improvement in the produce of private gardens proved so great, that it attracted general attention, and perhaps such a satisfactory show of vegetables has never been witnessed in India, and seldom surpassed in Covent Garden or other English markets.

The potatoes from Bombay, Darjeeling and Cherra Poonjee seed were wonderfully fine and healthy, and to enable the public to form some idea of the state of perfection this grand and staple vegetable has been brought to in this district, it is here recorded that forty potatoes out of one garden weighed 20lbs. The skin of all delicately white and fine, and every potatoe free from knots. The sugar-pea perhaps deserves to be next noticed. This splendid variety of the *Pisum sativum* was introduced on a small scale into this district last year, and from the acclimated seed, the crops are now most luxuriant, and more fruitful by far than any other sort, the pod is very long and almost transparent. Next comes the vegetable marrow, of which there were a few *dalees*. The crown variety or squash is a fine vegetable on the tables, but a longer variety, and of a greener color, exhibited on this occasion, is considered far superior to it in regard to flavour. Next come Globe artichokes, late cauliflower, of a fine size with delicately white heads. Savoy, red, and nonpareil cabbages: carrots from English seed. Turnips of the white stone or American flat variety of the most delicate flavour, celery of the finest description, *cum multis aliis*, were to be seen on the show tables in the greatest profusion. The produce of the Society's garden (none of the *dalees* of which are allowed to compete for prizes) consisted of—

Floricultural Department.—Ten varieties of roses, four varieties of *Verbena*, including the *Melindres*, three varieties of violets, viz. *Viola tricolor*, *V. odoratissima*, and *V. serpens*, four varieties of double and single stocks, double tuberose (*Polyanthes tuberosa*), *Euphorbia jacquiniiflora*, *Nolana prostrata*, *Bartonia aurea*, three varieties of *Jatrophas*, viz., *J. rosea*, *J. panduræfolia*, and *J. carnosæ*, *Asystasia formosa*, *Erysimum Peroffskianum*, *Malpighia glabra*, *Collinsia bicolor*, *Linaria speciosa*, *Phlox Drummondii*, *Clarkia elegans rosea*, *Maurandia Barclayana*, five varieties of *Pelargoniums*, *Aristolochia trilobata*, and *A. indica* or snake-plant, *Thunbergia alata*, *Ipomœa semperflorens*, and *I. rubro-cœrulea*, *Banisteria laurifolia*, Lupins of sorts, two varieties of *Tecomæ*, viz., *Tecoma jasminoides*, and *Tecoma stans*, *Saponaria officinalis*, *Beaumontia grandiflora*, and several varieties of other rare flowers.

Vegetable Department.—Marrow-fat, sugar, and other peas, drum-head, flat, Dutch, Battersea, Savoy, nonpareil, large and dwarf York, sugar-loaf, and other cabbages, Darjeeling and Bombay potatoes, Altringham, earlyhorn, long orange and Nepaul carrots, beet-root, and mangul wurzul, bush and crown vegetable marrow, late cauliflowerers, red and white nohl-kohl, flat, Dutch, white stone and purple-top turnips, Windsor and French beans. A large basket of the finest white celery, Globe and Jerusalem artichokes; endive beautifully blanched, coss and cabbage lettuce, Tenasserim and other yams. A basket of splendid Cabool capsicums, also love-apples (*Solanum lycopersicum*), onions, leeks, &c. &c. &c.

The umpires (Captain Don, Philip Crump, Esq., Robert Ross, Esq., and Moonshee Sultan Mohamed) pronounced the whole of the above enumerated vegetables remarkably fine, and highly creditable to our Branch Institution.

[Prizes were then awarded to ten *mallees* for best specimens of the vegetables and flowers already detailed, and for several other sorts.]

List of Donations since the 3rd of December, 1847.

From J. Duhan, Esq., Opium Agent, Bhaugulpore, the sum of ten rupees.

From Lieut. John Nelson Thomas, 39th Regiment N. I., a small supply of *Orchidææ*, from Darjeeling, which are thriving very nicely.

From C. Donzelle, Esq., of Toolseeah, a supply of pine-apple plants, of a very fine sort.

From Mrs. Pringle, Purneah, thirty pine-apple plants, one plant of *Daphne*, and one of *Vaccinium*, also a garden implement for transplanting, which proved most acceptable.

From Dr. Campbell, Darjeeling, three bags of Darjeeling potatoes, some cuttings of *Fuchsia* and raspberry plants.

From G. F. Brown, Esq., a few species of sugar-cane, of a very fine sort, brought by him from Dinagepore.

From Colonel Ouseley, Governor General's Agent, Chota Nagpore, a packet of China tea seeds.

From W. T. Taylor, Esq., Civil Service, Purneah, a supply of fine strawberry plants and pine-apple shoots.

From Mrs. Dr. Bowling, several packets of rare flower seeds, most of which germinated freely.

From Charles Smith, Esq., late of the Civil Service, Cherra Poonjee, several packets of seeds from the Cossia hills.

From Major Thoresby, Resident at Kutmandoo, some packets of Nepaul pine and other seeds, which have germinated vastly well.

From Melmoth Hall, Esq., Lehra, Goruckpore, continued contributions of seeds indigenous to that district, accompanied by dried leaves and flowers of the parent trees when practicable, also some English *Laburnum* seed.

List of New Subscribers since the 3rd of December, 1847.

Dr. William Martin, Captain Studdy, Henry Swetenham, Esq., C. S., Major General A. Watson, C. Steer, Esq., Charles Nelson, Esq., Moulvie Ojeh Oollah, Syud Mahomed, Zumeendar.

Friday, the 26th of May, 1848.

Our annual exhibition of cereal grains, and also one of vegetables, flowers and fruits took place yesterday evening, in the Society's show-rooms, and was attended by 13 ladies, about 80 members of our Branch Society, besides many visitors. The day previous was, it will be recollected, the Birth-day of our Gracious Queen, and a very eventful one it was in more respects than one, for about 3 o'clock p. m., day was suddenly turned into night, and a most furious

storm from the westward, accompanied by heavy rain, raged with unabated violence for an hour, and may, without exaggeration, be brought under the denomination of a hurricane. Trees were blown down or split into pieces, garden trellices carried away, boats wrecked or stranded, out-houses and huts unroofed in all directions, and nearly the whole of the mangoe crop was discovered under the trees. As may be supposed, such a stormy preface to the show did not tend to improve the floricultural specimens, or those in the fruit department. Captain Tickell, Dr. Chalmers, J. H. Savi, Esq., and Walter Landale, Esq., obligingly acted as umpires for cereal grains, fruits and vegetables, and tested with much care the samples laid out for competition. The show-room and its verandahs contained 25 large tables, every one of which was completely covered with *dalees*, and for want of more room several baskets of fruit and vegetables were laid along the ground. The produce of our Branch Society's garden in all departments was highly commended by the umpires, who pronounced every thing to be unexceptionable in quality.

The samples of cereal grains consisted of a large basket of superb wheat, acclimated from Nerbudda seed, presented to our Society three years ago by Colonel Ouseley, of Chota Nagpore, two baskets of acclimated Scotch and Kutmandoo wheats, (the former grown from seed presented to the Society by Edgar Lautour, Esq., of the Civil Service, and the latter by Major Thoresby, Resident Kutmandoo) of a very superior description. Very fine oats, grown from seed sent out by the Hon'ble the Court of Directors and presented to us by the Parent Society, a beautiful sample of barley, grown from Kutmandoo seed, sent us by Major Thoresby, two new sorts of *dhall*, white linseed and flax seed, potatoes, a large basket of the Bombay sort, weighing upon an average thirty tolahs each, a large basket of fine Cuba and Havanah tobacco, of the growth of 1846, and which was a complete nosegay to those fond of a weed or the *hooqah*.

Fifty large baskets of vegetable seeds, acclimated from Cape, English and American seed, four *dalees* of splendid peaches, two of fine grapes, *alloo-bokharas*, plantains, sour-sops, asparagus, beet-root, cucumbers, red cabbages, carrots, Bombay and Cabool onions, &c. &c., and in the floricultural department some rare exotics, too numerous to detail (one in particular, the *Portulaca grandiflora*, was in lovely

blossom), likewise some Bombay mango grafts, lately separated from the parent trees, with a fine mango on each.

Next comes the awarding of prizes for the produce of private gardens and farms in this and adjacent districts.

A silver medal was awarded to C. Donzelle, Esq., of Toolseah, for the finest samples of cereal grains, pulse, seed of Lima and other fine varieties of beans, a basket of very fine onions, &c.

A money prize of five rupees was awarded to Dr. Denham, Civil Surgeon, Gyah, for the following samples of cereal grains: one bag of superb acclimated Nerbudda wheat (seed furnished by the Bhaugulpore Society), one of vastly fine acclimated Scotch wheat, one of very superior acclimated oats from English seed, sent out to the Parent Society by the Hon'ble the Court of Directors, one of white gram, grown from seed furnished from our Branch Society. The umpires would most certainly have awarded a medal to Dr. Denham had his samples been more numerous. There were numerous samples of grain from the farms of G. Barnes, Esq., of Colgong, Rajah Oodit Narain Sing, of Aulumnuggur, Muddun Tackoor, Zumeendar of Kulan, Bhaugulpore, *cum multis aliis*, but after a most patient inspection of all, the umpires did not consider any sufficiently good to deserve a medal. In closing the account of agricultural produce, it is but proper to mention, that in consequence of no rain having fallen here from November last up to harvest time in this district, cereal grains of all sorts are mostly of a very inferior description this year.

A silver medal was awarded to George Drummond, Esq., of Peer-gunge, Purneah, for three large baskets of the finest peaches perhaps ever seen in Bengal,* many of them weighing twelve tolahs, also a basket of magnificent acclimated Darjeeling potatoes, many of them weighing thirty-five tolahs each. These potatoes were very free from knots, and had a very fine skin, also some very fine cucumbers, Bombay and Patna onions, and a remarkably fine bundle of asparagus, grown in the garden of G. H. Gatsfeld, Esq., of Mohinderpore, Purneah. Mr. Drummond is certainly taking the lead as an horticulturist in the Purneah district, as far as our Branch Society has

* It will be seen from the proceedings of the Parent Society, for July 1848, page cxxi, that Dr. Scott has raised this year in his garden at Gowhatti, Assam, scores of peaches, weighing upwards of 10 and 20 tolahs each.—Ens.

had the means of judging, and we trust the time is not far distant when Mr. Drummond will carry off a medal for cereal grains, notwithstanding the soil of that district is generally considered unfavorable to wheat and barley cultivation.

We were glad to see a few samples of cereal grains and pulse from the farms of R. Buckland, Esq., of Gocoolnuggur, Purneah, and from the native zumcendars of that district.

The following is the result of the competition for horticultural produce :

The sum of 54 rupees 8 annas was awarded in prizes, and we must not omit the mention of the Ladies, viz., Mrs. Alexander, Mrs. Taylor, and Mrs. Shore, who most kindly tested the floricultural specimens, and distributed the prizes.

To the gardener of J. Pontet, Esq., the sum of six rupees, for two beautiful plants of the *Gesneria* family (natural order *Gesnericæ*), two plants of *Mammillaria* (natural order *Cacticæ*), for the greatest variety of geraniums, and two splendid plants of lavender.

To the gardener of W. S. Alexander, Esq., C. S., the sum of 4 rupees 4 annas, for a beautiful plant (in fine blossom) of the *Phlox Drummondii*, a fine bouquet of *Solanum macranthum*, and for grapes, peaches, and Bombay mangoes.

We must now bring to notice our having received from T. Wyatt, Esq., Civil Service, Rungpore,—

Twelve fine sapotas, one of an unusually large size, some peaches, leeches, Rungpore plums, and some very fine acclimated Darjeeling potatoes, and although the distance between the two stations must be nearly 200 miles, still these fruits, &c. arrived in excellent order. Prizes to the amount of six rupees were awarded to Mr. Wyatt's gardener.

Prizes were awarded to ten other *mallees* for best samples of vegetables, fruits and flowers, and last though not least we have to note, that a prize of two rupees was awarded to the *mallee* of Robert Fulton, Esq., of Sultangunge, for a remarkably fine bunch of grapes, clearly showing that either the soil of Mr. Fulton's garden, the climate of Sultangunge, or the skill of that gentleman's gardener, are highly favorable to the growth, and bringing to maturity of this delicious fruit.

In conclusion, we have much pleasure in notifying that on the 17th ultimo, a large supply of fresh vegetable and flower seeds (our

Branch Society's annual supply) reached Calcutta from the Cape, from that well known and experienced Seedsman, Mr. Upjohn, on the Ship "Zenobia," and that several thousand flower plants, fruit-grafts, grapes, vines, &c. are now ready for distribution : moreover, that our stock of acclimated seeds is unusually large and fine this year.

REPORT OF AN EXHIBITION OF FLOWERS AND VEGETABLES HELD
AT CUTTACK, ON 10TH FEBRUARY 1848.

(Communicated by W. GILMORE, Esq., Secretary Branch Agricultural Society, Cuttack.)

I have the pleasure to send you the following report of an exhibition of flowers and vegetables, held on the 10th instant.

In consequence of the late period at which the rains ceased, the vegetables produced for competition were not so fine as they might have been : the only specimen of potatoes was produced in the public garden, and the few specimens of cauliflower, were so poor that no prize was given for them. The flowers were very good and in great variety.

The few seeds of *Ipomœa rubro-cœrulea* forwarded by you, all germinated and flowered in the greatest profusion.

I shall have much pleasure in sending you a packet of the seed, should the Society desire it. The sweet-peas (from Lucknow) are also in full flower.

The amount distributed in prizes was rupees thirty-four. One medal was awarded for the best bouquet of flowers. Subjoined is a list of the prizes.

CUTTACK : 19th February, 1848.

Prizes were awarded to—

Mr. Gouldsbury's mallee for best Turnips.		
Mr. Mactier's	ditto,	.. 2nd ditto ditto.
Mr. Gilmore's	ditto,	.. Carrots.
Ditto	ditto,	.. Cabbages.
Ditto	ditto,	.. Khole-kole.
Mr. Deede's	ditto,	.. Celery.
Ditto	ditto,	.. Savoy Cabbage.
Ditto	ditto,	} Onions.
Mr. Mactier's	ditto,	
Mr. Ainslie's	ditto,	.. Peas.
Ditto	ditto,	.. Beet-root.

Mr. Deede's mallee for best *dallee* of vegetables.

Mr. Gouldsbury's ditto, 2nd ditto ditto.

Mr. Deede's ditto, for best bouquet of flowers.

Mr. Gilmore's ditto, }
Mr. Mactier's ditto, } for 2nd ditto ditto.

HINTS FOR THE SELECTION OF THE SENNA PLANT AND
ITS PREPARATION FOR THE EUROPEAN MARKET.

TO J. HUME, ESQ., *Honorary Secretary Agricultural Society.*

SIR,—The Medical Board, under instructions from the Government of India, have desired me to forward to you copy of para. 14 of a Dispatch, No. 25, of the 29th September last, from the Court of Directors of the East India Company, together with the printed Extract of Professor Royle's work on *Materia Medica*, Article "Senna," to which it gave cover.

2. The communication, as containing useful hints for the selection of the plant and its preparation for the European markets, will, it is hoped, be considered to be sufficiently interesting to the members, and to the public generally, as to induce you to further the views of the Court by giving it a place in an early number of the Transactions of the Society.

J. FORSYTH, *Surgeon,*

FORT WILLIAM :

Secretary Medical Board.

Medical Board Office, 3rd February, 1848.

Extract from a Dispatch from the Honorable the Court of Directors, in the Public Department, No. 25, dated 29th September 1847.

"14. The Senna grown in the Seharunpore Botanic Garden, and which the Natives in the neighbourhood of Agra and Muttra are said to cultivate extensively, having been found to be of the best quality, we approve the proposal of the Medical Board that the Senna for the public service should be supplied from Seharunpore. We forward as a number in the packet an extract from a work on *Materia Medica* by Dr. Royle, containing a description of the various species of the Senna plant, and suggestions for its improvement for

the European market by more careful picking. It would be desirable to adopt means for making this information generally known."

"The Sennas of commerce may be arranged as follows :—

"1. **TINNIVELLY SENNA**, first cultivated in the district of that name, in 12° N. lat. by the late Mr. Hughes, from seed probably obtained from Arabia or picked out of *Suna Mukki*, as was done by the author when he cultivated Senna at Scharunpore. (*v. Himal. Bot.* p. 186, t. 37, and *Trans. Med. Soc. of Calcutta*, v. p. 433.) The author also grew Senna from Tinnivelly seed sent to him by Sir C. now Lord Metcalfe; but he did not find the smallest difference between the two when grown in the same situation. The Tinnivelly Senna is well-grown and carefully picked; the leaflets are of a fine, rather lively green color; thin, but large, being from one to two inches in length, truly lanceolate. This kind is "highly esteemed in this country, and is quickly displacing all the other sorts in this (that is, Edinburgh), and many other cities in Britain." (Christison.) Dr. A. T. Thomson says of it, it is mild in operation, certain as a purgative, and operates without griping. It is now cultivated by Mr. Hughes' successor.

"*Scharunpore Senna*, the same kind of Senna, cultivated at Scharunpore, differed only in the leaflets being smaller, as might be expected from the more northern latitude (30°). These the author prescribed in the hospitals at Scharunpore, and found them effective as a purge, and operating without producing inconvenient nausea or griping. Mr. Twining, after trying them in forty-five cases in the General Hospital at Calcutta, says in his report to the Medical Board: "From these trials, I am disposed to consider the Senna now under trial equal to the best I have ever seen."

"*Madras Senna*. Senna is now imported also from Madras, the produce of that Presidency. In 1843-44, I find 11,536 lbs. were exported to this country, having been previously imported into Madras from Tinnivelly, where it is cultivated by the natives, and is of the same nature as Mr. Hughes' Senna, though not so well grown nor so carefully picked. Dr. Christison says of it, the leaflets are longer than those of Bombay Senna, and not so taper-pointed, but otherwise differ only in being better preserved, and being more active, are more esteemed.

"Dr. Searle, in a communication to the India House, says of this Senna, "that now furnished to the profession by the Madras Government is in my experience as good quite as the Alexandrian." "every leaf of the Indian being of the genuine spear-shaped species."

"2. **BOMBAY or Common Indian SENNA**, *Suna Mukki* of the natives, is first imported into Bombay from the Arabian Gulf.

"316,728 lbs. in 1837-38 | 570,426 lbs. in 1838-39.

"Re-exported to Great Britain, 202,284 lbs. in 1838-39.

"That this Senna forms a large, if not the largest proportion of what is consumed in this country, is not only evident from the above importation, but also from a comparison with the whole quantity of the other Sennas imported, as given by Dr. Pereira.

	1838.	1839.
"From East Indies ..	72,576 lbs.	110,409 lbs.
"From other places ..	69,538 "	63,766 "

"Some of this Senna is no doubt produced in Africa, as stated above by Dr. Malcolmson; a good deal of it in Arabia, probably by *Cassia lanceolata* and some perhaps by *C. Forskalii*. The leaflets are thin, lanceolate, usually entire, about an inch or an inch and a half in length, narrower than either the Tinnivelly or Seharumpore Senna, probably from growing in a poorer soil and drier climate. They are of a pale green color, often with dark brown-colored leaflets intermixed, also some pods, and many leaf-stalks, with occasionally other impurities. The good specimens of this Senna are, however, of excellent quality, and its commercial and medical value would be much increased, if the finest leaflets were picked out. It is in constant use in hospital practice in India, and generally highly approved of. The author prefers them for all purposes to the following kinds as found in commerce.

"3. ALEXANDRIAN SENNA is an excellent kind, when the genuine lance-shaped leaflets have been picked out; but that commonly employed in this country, is a mixed and very impure kind, being made up of the leaflets, much broken, of *C. lanceolata* and of *C. obovata*, with some pods and broken leaf-stalks, and also with leaves of other plants. It should be used only after having been carefully picked, as directed in the E. P. Picked Alexandrian Senna is of a pale green color, with a faint smell. The leaflets are broad-lanceolate, the two sides unequal; they are thicker and shorter than the Indian Sennas.

"The lanceolate Senna of Upper Egypt, Nubia, and Senaar, yields two crops annually, the plants being cut down in spring and autumn, dried in the sun, when the leaves are stripped off, packed in bales, and sent to several *entrepôts*, and finally to Boulae, in the vicinity of Cairo. Of the lanceolate Senna five parts are here mixed with three parts of the leaflets of *C. obovata*, brought from other parts of Egypt and even from Syria, and also with the leaves (two parts) of *Cynanchum Argel*. This mixed Senna is that exported from Alexandria. On the Continent a further addition is made of the leaves of *Colulea arborescens* and of *Coriaria myrtifolia*.

"Dr. Pereira states that, "under the name of *heavy senna* he has met with *argel* leaves, which were sold at a higher price than ordinary *senna*," and Dr. Christison mentioned, what indeed may often be seen, that is, *Argel* leaves left intermixed even in what is called picked Alexandrian Senna. This Senna is often called "Séné de la Palthe."

"4. **TRIPOLI SENNA**, is brought from Fezzan to Tripoli. This has the general appearance of Alexandrian Senna, but is less esteemed, though it is a more pure Senna, probably because the leaflets are more broken down, and all the leaf-stalks have not been removed. The leaflets are shorter and less pointed than in lanceolate Senna—indeed, more ovate; hence this Senna is said to be produced by *C. ovata* (*C. æthiopica*); but it also contains leaflets of *C. obovata*, which species was found in Fezzan by Dr. Oudney.

"5. **ALEPPO SENNA** is now seldom imported into this country. It consists of the leaflets of *C. obovata*, as do some other kinds, such as **ITALIAN SENNA**. Dr. Ainslie says, that the *obovate* is the only kind of Senna met with in India, meaning the Peninsula of India; for it is not met with in the Bengal Presidency; nor, according to Dr. Searle, is it used in that of Madras at the present day. It is less effective as a purgative, and apt to create nausea and griping.

"**Adulteration.**—Commercial Senna is prepared for use by picking out the leaflets, and rejecting the leaf-stalks, also extraneous matter, as dust, date-stones, &c., as well as the leaves of other plants. The legumes, however, possess the cathartic properties of the leaves to a considerable extent, and were alone used by the original Arabs; and there is no reason to believe that the stalks are inert. The most important adulterations are, however, the leaves of other plants. Those of the *Argel* may be distinguished by being lanceolate, equal on the two sides of the midrib, thick, leathery, and paler. They operate very dubiously as a cathartic, but occasion griping and protracted sickness. Those of *Tephrosia Apollinea* are obovate downy, and the veins proceed transversely from the midrib to each margin of the leaf without forming a marginal vein. The leaves of *Colutea arborescens*, or Bladder Senna, are ovate, but equal at the base. Those of *Coriaria myrtifolia* are astringent, usually broken down, and marked on each side of the midrib with a strong lateral nerve. As the systematic adulteration of Senna in Egypt with the leaves of other plants is objectionable, and has been so noticed by the Pharmaceutical Society, the most efficient method of stopping it would be to purchase only the pure African and Arabian Sennas which come to us by Bombay, instead of (unless it has been picked) that which is called Alexandrian, from its place of export (*v. P. J. ii. p. 36*). In India, a good substitute for Senna is afforded by *Ras Suna*. (*v. COMPOSITÆ.*)"

NOTICE REGARDING *ARISTOLOCHIA ANGUICIDA*—SNAKE ARISTOLOCHIA, OR BIRTHWORT.

Extract of a letter from R. W. G. FRITH, ESQ., dated 13th May, 1848.

I believe the Society do not receive "*Curtis' Botanical Magazine*," I therefore send you an extract from that work, taken from the March No. for 1848, which I have just received, of a species of "*Aristolochia*," *A. anguicida*, *Snake Aristolochia* or *Birthwort*.

I send this, thinking it may be interesting from the mention made of the fact, of the plant being used in both the Americas by the natives, not only for the destruction of venomous snakes, but for the cure of persons who have been bitten by them. The discovery of this remedy having been so recently made in this country, and as is generally the case in such circumstances, remaining a matter of doubt with many, as to its real efficacy in the cure of snake-bite.

The notice of this plant in the Magazine is accompanied by a colored illustration of it in flower, which perhaps you would like to see. The account states it to be "a singular and very little known species of *Birthwort*, native of new Granada."

"Jacquin discovered it at Carthage. Our Collector, Mr. Purdie, sent it to the Royal Gardens of Kew, where it first flowered in December, 1845. As the natives of North America employ the *A. serpentaria* (which Mr. Bosch says is one of the most active sudorifics known) for destroying serpents, and also for curing persons bitten by those reptiles, so the natives of South America (new Granada) employ this for similar purposes. "The juice of the root," according to Jacquin, "mixed with the saliva by mastication, renders powerless a serpent of moderate size, if one or two drops are put into the mouth of the creature, when it may be handled for several hours and put into the bosom with impunity; but after a time the animal recovers: a larger quantity however occasions its death."

"Jacquin attributes to the odour of the root the faculty of driving away serpents, when they approach this plant; and he also relates, that "the juice applied to the recent bite of a serpent, or taken internally, infallibly cures the patient."

RESULT OF TRIALS GIVEN TO CERTAIN SEEDS AT CAWNPORE.

Extract of a letter from Lieut. JOHN ELIOT, dated Cawnpore, 14th February, 1848.

“I must now give you some accounts of the success with my seeds—flower, vegetable and farm. To begin with the last ; the barley did not germinate though dibbled in garden ground with care, so I did not sow the wheat. The hemp came up, but appears exactly the same as that sown by the ryotts all about here : a few seeds of mangul wurzel germinated, and I have now some very fine plants which I am keeping for seed ; in case you should like to have any let me know, I will send some down. The kohl rabi and cabbages succeeded ; the latter grows to an enormous size, and throws out innumerable offshoots, and would prove very valuable for feeding cattle I should think, particularly in this part of the country, during the hot season, at which time green fodder is not procurable for love or money. The tares did not come up, but the clover (of 3 sorts) has ; one sort, with a yellow blossom, grows most luxuriantly. This completes the farm seeds I think. The vegetable seeds all came up well but the French beans, which seem to lose their germinating power or vitality sooner than peas. I will now give you the names of the flower seeds that germinated : scarlet Brompton stock, large, white, 10 week stock, *Escholtzia crocea*, *Calliopsis bicolor atro-sanguinea*, *Nemophila insignis*, *Petunia Phœnicia*, a very beautiful dark purple, *Collinsia bicolor*, *Convolvulus minor*, *Calliopsis Drummondii*, *Cineraria*, *Clarkia*, *Godetia Lindleyana*, *Balsam*, *Schizanthus humilis*, *Zinnia elegans*, *Portulaca grandiflora*, *Salpiglossis*. This makes only 16 or 17 out of 37, which was the number of English flower seeds I received ; some of the American have come up of the same kind as those which failed from English : thus—*Heartsease*, *Larkspur*, *Campanula*, &c.”

*A list of specimens of Veneered American Woods, presented to the
Society's Museum, by C. HUFFNAGLE, Esq.*

No. 1. American elm. *Ulmus Americana*.

This is a relic of the tree under which William Penn held his famous treaty with the Indians, where Kensington now stands.

2. Common yellow pine. *Pinus variabilis*.

3. Red mulberry? *Morus rubra*.

4. White oak. *Quercus alba*.

5. Sugar maple, variety "Bird's eye." *Acer saccharinum*.

6. Chesnut. *Castanea*.

7. Sugar maple, variety "Blister maple."

8. Black walnut. *Juglans nigra*.

9. American Bird cherry. *Prunus scrotina*.

10. Tulip poplar. *Lireodendron tulipefera*.

11. Beech. *Fagus Americana*.

12. Sugar maple. *Root*.

13. "Green ebony" so called by the cabinet makers. *Unknown*.

14. Orage orange, or bow-wood. *Maclura aurantiaca*.

15. Butter-nut or white walnut. *Juglans cinera*.

16. Persimmon.

17. "Red elm," so called by the cabinet makers. *Ulmus sp.*

18. Elm from a *Knarl*.

19. Candle tree. *Catalpa cordifolia*.

20. American Bird cherry. *Knarl*.

21. Elm, *sp.?*

22. Beech. *Betula sp.*

23. Red cedar. *Juniperus virginica*.

24. Sassafras. *Laurus sassafras*.

25. American plane or button-wood. *Platanus occidentalis*.

26. Sumach. *Rhus glabra*.

27. Yellow locust.

28. Black walnut. *Knarl*.

29. Hickory. *Juglans salcata*.

30. White ash. *Fraxinus Americana*.

31. Live oak or navy oak. *Quercus virens*.

Observations upon the best methods of Packing Seeds for a voyage to India or China. By ROBERT FORTUNE.

When I was about to leave England for China in the spring of 1843, I was desired by the Council of the Horticultural Society to procure a quantity of seeds, and to have them put up in different ways, in order to test the best methods of packing such things for a long sea voyage to a distant country. Messrs. Wrench and Sons, of London-Bridge, supplied a large portion of the seeds, the remainder were made up in the garden of the Horticultural Society. In order to make the experiments as complete and satisfactory as possible, the same kinds of seeds and from the same samples were packed in three different ways. One lot was put up in bottles and sealed; a second was packed in paper and put into a box lined with tin; and a third was merely put in paper, and thrown loosely into a canvas bag to be hung up in my cabin. When I arrived at Hong-Kong, Messrs. Dent and Co. kindly placed their garden at my service for any experiments of this nature which it might be necessary to try. It was in the month of July, and the rays of the sun were too fierce, and the ground too dry, for the purposes of securing a crop; but a certain portion of the seeds was immediately unpacked and sown for experiment in a corner of the garden which was partially shaded by the house.

On examining the seeds in the sealed bottles, I observed that many of them were moist and mouldy; in some instances they appeared to have swelled to a certain extent, as if vegetation had been commencing; in other bottles they were perfectly dry, and seemed in good condition. The results were as may be expected; those seeds which were taken out of the mouldy samples all failed to vegetate, while the others came up well enough. Although I think the system of sending out seeds in sealed bottles is a bad one and ought never to be adopted, yet they might be sent out in this way in good order, provided the air in the bottles was well dried, and the seeds also, before being packed. But it is a difficult matter to dry thoroughly certain kinds of seeds which contain a large quantity of albumen. In the passage to India, China, or Australia, the temperature is often changed; at one period the seeds are broiling in a high temperature under the line, a few days afterwards they are in a cold damp atmosphere, when the vessel is running down her "casting" far to the south of the Cape of Good Hope. In the case of India and China, the seeds again cross the line before they arrive at their destination. When in a high temperature, every particle of moisture is drawn out from the seeds into the bottles, which become little stoves or Ward's Cases for the time, and in which the first stage of germination commences. Other circumstances, however, are not favorable, and the vessel in the mean time sails onward in her course towards colder latitudes, vegetation is checked,

a mouldiness ensues, and the vital principle of the seeds becomes extinct. This is what really takes place when seeds are packed in sealed bottles not perfectly dry, and, as this system of packing has no advantages which I know of, it is much better never to adopt it.

Those seeds which were taken out in boxes lined with tin were nearly all in good condition; so were those which were packed loosely in a canvas bag and suspended in the cabin. I have already said that the season at Hong-Kong, when I arrived there, was too hot for English seeds. After sowing a few for the purpose of experiment, the remainder were taken to Chusan and the other northern ports which I visited at that time. Dr. Maxwell, of the Madras army, had a small garden on the island of Chusan, which he rented from the Chinese. Here a great many of the seeds were sown, and the results as regards their vegetation were the same as I have already related, and confirmed the experiments made under unfavorable circumstances at Hong-Kong. But the climate of Chusan being much more favorable to European seeds, they not only vegetated, but grew afterwards with great luxuriance.*

Each of these two modes of packing has its peculiar advantages. Seeds, of course, can be packed more securely in tin for a long voyage, but when this mode is adopted they should be carefully dried, as well as the paper in which they are put up, before the box is closed. The method of packing in canvas bags, which are hung in a cabin or other airy part of the vessel, is the best of all, because any moisture which may evaporate from the seeds or paper during the voyage can readily pass into the air. But it is often difficult to induce captains of ships or others to allow packages of this kind to be swinging about in cabins, and unless some one can be got to take charge of them who can be depended upon, I should prefer the mode of drying the seeds well, and packing them in a box lined with tin.

Another matter of equal importance as regards success is the age of the seeds. Old seeds in many instances are almost sure to fail. Even in this country, where seeds can be kept in the most favorable circumstances, many will not vegetate the second year. In sending them to distant

* The natives, who had never seen any peas but the common field kinds, were much surprised at the growth of our English ones, which in this favored climate attained a much greater size than they do at home. As the stems grow in height, the Chinese, with their characteristic conceit, told us that their own kinds were much better than ours, for that ours would produce nothing but stems and leaves. But when, in due course, the fine tall rows were covered with a sheet of white bloom, and when the large pods began to swell, the Chinese were fain to beg a portion of the produce to sow in their own gardens. These, with many other seeds, were given to them with much pleasure, and it is hoped are now cultivated to some extent—unless, indeed, they have been destroyed as belonging to the “barbarian,” at the time the comfortable houses and hospitals were pulled down, which were left in good condition by the English when the island was restored in the spring of 1846. It is a curious fact that the moment the place was evacuated the Chinese began to pull down the houses erected at considerable expence by the English during their residence on the island.

countries, therefore, where they will have to pass through many changes of temperature, none but those of the last gathering should be sent. The Honorable East India Company, with that enlightened liberality which does them so much credit, kept up a large establishment at Calcutta for the purpose of procuring and sending the natural productions of India to England. For many years scarcely any of the seeds thus sent would vegetate when they reached this country. At last the reason of this want of success was solved. A young man from the Calcutta garden having been sent over to England for the purposes of improvement, was asked to explain the method of preparing these seeds for exportation. It came out that seeds were gathered year after year and stored in the same drawers; that, in fact, the young seeds were always mixed with the old ones which remained from former gatherings. When parcels were ordered to be made up for Europe these drawers were opened and the seeds taken out of them. Of course the packages so made contained a great portion of seeds which had been gathered years before, and whose vitality was much weakened or altogether gone.

Before seeds are packed for foreign countries, they should always be looked over, and those infested with insects carefully removed. These little animals make sad havoc amongst a packet of seeds during a long voyage.

From what I have stated it will be observed, that the length of the voyage, the dampness of sea-air, the variations of temperature, and the attacks of insects, are the greatest difficulties we have to contend with in the exportations of seeds to distant countries. These however, may be in a great measure overcome by attending to the directions I have given for the preparation of the seeds. I may mention that by far the best way of sending small boxes of seeds to India or China is by the overland route, *viâ* Southampton. The expence of sending any box of small dimensions—say a foot, or a foot and a half, cubic measurement—by this conveyance will be less than its freight would be if sent by ship round the Cape; it will reach its destination in half the time, and the variations of temperature will be less. The post-office can also be used with great advantage in sending out small packets of the choicer kinds of seeds, and there is no plan which is more likely to be successful than sending them in a letter. A letter weighing an ounce will only cost two shillings, and may be made to hold a great number of interesting seeds for which a friend in the East would gladly give two gold mohrs; and if, in conclusion, I might give a word of advice to those who have friends in distant countries as to the kinds of flower-seeds which will prove most acceptable, I would say, send above all those common things which, from time immemorial, have been favorites in our woods and gardens. They will be prized much more than any thing which we consider new or rare. A friend of mine, who has a garden in one of the northern Chinese towns, and to whom I sometimes

send plants and seeds, writes thus :—" Send me some roses of various colors, but amongst them a plant or two of those *friends of my youth*, the cabbage and moss."—*Journal of the Horticultural Society of London*, Vol. iii, part I.

View of the State of Agriculture in the British Possessions in the Straits of Malacca. By J. BALESTIER, ESQ., Corr. Mem. of the Am. Institute, Member of the Academy of Rhiems, &c. &c. &c.

Before entering on the following rapid survey of agriculture in the British possessions in the Straits of Malacca, it may be well to say a few words regarding the physical and political conditions of the country.

The "Straits' Government" embraces the island of Penang (Prince of Wales' Island) and its adjacent Province Wellesley, on the Malayan Peninsula; the island of Singapore and Malacca, situated like Province Wellesley on the mainland. The three Settlements lie on the easterly side of the Straits of Malacca, occupying as many unconnected spots from Lat. $1^{\circ} 17'$ to $5^{\circ} 25'$ North, and $100^{\circ} 25'$ and 104° East Long.

Each of the three Settlements has a presiding magistrate, under the name of Resident Councillor, and over them presides a Governor, appointed, as the Resident Councillors are also, by the Governor General in Council of India. The Straits' Government is subordinate to the Government of Bengal.

The aboriginal population consist of Jakoons, a people quite in a state of nature, who are the tenants of almost impenetrable forests, and of Malays more or less civilized. To set down the population of the country at one person per square mile is not thought to be an under-estimate by those who have had the best opportunities of judging after exploring the interior. This estimate of course does not refer to the large towns in the occupation of Europeans.

The climate of the Straits is rather more humid than dry. There can hardly be said to be, as in most other tropical countries, a dry and a wet season, and hence an agreeable temperature and continual verdure prevail throughout the whole year. The thermometer ranges from 70° to 85° , and even down as low as 66° in the cool nights in January.

The general character of the country has been described by one whose means of inspection have been considerable, and whose geological attainments constitute him a competent judge, thus :—

"The elevated parts of the Straits' Settlements are composed, either of plutonic (principally granitic) rocks, or stratified clays, shales and sandstone, varying in their texture and composition, and frequently impregnated with iron. The island of Penang is one granitic mass, which changes

its mineralogical, and consequently its agricultural character, as we proceed from the north to the south. From the surface of the channel and of Province Wellesley many low hillocks and ranges rise, some of which are granitic and others sedimentary. Malacca (including Naning) and Singapore consist of groups and ranges of hills amongst which long and narrow vallies ramify. Granite and allied plutonic rocks are largely developed, forming extensive tracts in the Malacca territory, and, contrary to the opinion that has generally prevailed, composing the larger part of Singapore. The plutonic action which the sedimentary rocks have undergone in a greater or less degree has, in many places, veined and impregnated them with iron, and some times so largely as to give them a completely iron-masked or lateritic character, a circumstance very necessary to be remarked in an agricultural point of view.

"The vallies and plains are for the most part alluvial, and consist chiefly of clay. Amongst this sand appears occasionally forming bands of some breadth, but more often extending in long narrow zones, raised a little above the level of the clayey flats. Where swamps have been formed by such sand belts banking in the water, vegetable matter has been accumulated. Its depth is regulated by the level which the clay or sand flat that has been banked in had previously attained, and in different localities varies greatly. Where new, it consists of fragments of wood and masses of aquatic plants, more or less decomposed, and where old, of a soft, black, peaty matter, spongy and elastic at the surface, and below passing into a thick vegetable mud."

From which description it will be inferred, that the soil is generally good, which will be readily admitted on seeing the gigantic trees and the thick underwood, of which the interminable forests are composed of, along the whole coasts from Johore to Province Wellesley, a distance of upwards of four hundred miles.

Until very recently Europeans had done little in plantations of any kind. In the early part of the present century, the high prices which spices bore, induced several Europeans to commence the cultivation of pepper, nutmegs and cloves on the island of Penang, then recently ceded to the East India Company, and made a principal place of stoppage for their ships trading to China. But subsequently a long period of uninterrupted peace induced larger productions of these products, and consequently lowered their value, which, together with the very high pretensions of the Company for the occupation of waste lands, deterred enterprising Europeans from applying for them. But after some years a modification of the terms, with the prospect of a diminution of duties on sugar, led to the establishment of considerable sugar plantations in Singapore and Province Wellesley under European management. The boon obtained by the last named place in having her sugar and rum imported into the home markets, on payment of the reduced duties, encouraged the extension of cultivation

there, whilst the denial of the same advantage to Singapore at once checked any further efforts in sugar cultivation.

So recently as 1843, the official reports of Penang show, that only 353 cwt. 3 qrs. 10 lbs. of sugar and 4,000 gals. of rum were exported, whilst the records of the same office exhibit the following subsequent reports of exports, viz.,—

1846, from 1st July to 31st Dec. 13,000 piculs sugar, 10,040 gals. rum.

1847, from 1st July to 30th June 28,500 piculs sugar, 13,000 gals. rum.
and from 1st July to 31st Dec. the exports were estimated to be—

35,200 piculs sugar.

59,000 gallons rum.

In the course of a very few years, the exports will probably rise to about 1,000,000 piculs, when, as all the territory under the jurisdiction of the East India Company will have been taken up and under cultivation, no more ground will be available unless a further cession of territory should be asked for by the Indian Government, and ceded to them by the chiefs of the adjoining native states.

In the meanwhile nutmeg, cocoanut and rice cultivation have been on the increase on the island of Penang and in the Province, which, with the returns of the cane lands, have made of George Town, so recently wearing the internal signs of decay, a bustling and flourishing mart.

The natural fertility of the soil in Province Wellesley, which generally is level and little raised above the adjacent sea, assisted by abundance of fish, bat-guano and other manures, of which the Chinese avail largely, cause large returns from the land, amounting in some instances to three tons of raw sugar or *gour* per acre. The cultivation of the cane is generally carried on by Chinese, who yearly emigrate in large numbers, from Amoy chiefly, and who let themselves out for one year to Europeans or to Chinese cane-growers, at from three to four Spanish Dollars per month, they finding themselves in food, clothes, &c. The Chinese, for the most part, manufacture a coarse quality of sugar, called jaggery, but they generally prefer to contract with Europeans who have mills and apparatus for manufacturing sugar and rum, to deliver to them their canes at from one and a quarter to one and a half Spanish Dollars per picul of the *gour* made therefrom. As planted canes are from twelve to fourteen months before they are ripe, and ratoons from ten to eleven in the Straits, the planter gathers two full crops in two years. Many laborers come also from the Madras side of India, who let themselves out on the estates, and are more prized for various kinds of plantation works than as cane cultivators.

Both in Province Wellesley and at Singapore, sugar is manufactured by Europeans after the West India process. Almost every estate is provided with steam or water power to express the cane, and the juice is concentra-

ted in coppers of various forms, placed in ranges, under which the dried expressed canes are used as fuel. Rum is also made as in the West Indies.

Neither the plough, the harrow, nor any other agricultural helps are in general use; the hoe being the only implement of husbandry employed by Chinese, or Malay or Kling coolies in the Straits, with the exception only of one estate where European implements are used,—and hence the great number of laborers employed on a comparatively small extent of canes. Two and a half acres is the most that a Chinaman cultivates in the year, and even this little is only obtained by hard driving, if working on monthly wages for a European. The returns from which would be about forty piculs of dry sugar, whilst in Louisiana, in the United States, where implements of husbandry adapted to this culture are freely used, and notwithstanding the immatured condition of the canes when cut,—which, owing to the cold season, are obliged to be manipulated before they are ten months old,—each hand, or laborer on the estate, men, women and children, able to work, produces from five to seven hhds. of sugar, of about one thousand pounds each, according to the returns made to and published by the Congress. A quantity truly enormous, considering that from twenty-five to thirty per cent. of the laborers on a sugar plantation are either idlers so called (persons employed at various works out of the fields) or disabled by sickness. But the contrast between Louisiana and Java, in the extent of production according to the number of laborers, is still greater than here, for, according to “Temminck’s General view of the Dutch Possessions in the Indian Archipelago,” not less than 2,440 men are variously employed in producing a crop of 6,000 piculs of sugar on an estate of 400 bahus or bouws, which is about equal to an English acre. The same writer states, the price of field labor at $\frac{12}{1001}$ of a Dutch florin, equal to one cent. and a half of a dollar per day and food not found.

This immense economy of manual labor in Louisiana shows but too clearly the advantage to be obtained in the use of suitable helps and implements. Sixty stout mules, thirteen ploughs, and about a hundred and fifty hands or slaves, suffices for the cultivation of six hundred acres of canes, and two hundred of Indian corn, besides cutting a sufficiency of wood for the steam engine, and range of concentrating coppers. But manual labor is not wasted there as in most of the sugar growing countries, particularly on this side of the Cape of Good Hope. There, the drills or furrows are opened with ploughs, there the grasses and weeds are extirpated by the same implements or by harrows, there the banking of the canes so slow in turning up, and so expensive in making here, is done with a subsoil plough, which not only throws up a bank for the present purpose but brings up to the surface, there to remain exposed to the influence of the atmosphere for some months a fresh body of earth held in readiness for the next crop. With these appliances, and with

thorough drainage where needed, it is that the Louisiana planters obtain from unripe canes, in a season of nine or ten months, more than double the quantity of sugar from a given extent of ground than in any place within the tropics.

The cultivation of the land as a business, except in raising paddy or rice, cannot be said to exist at Malacca. Nothing indicates that the Portuguese or the Dutch paid any attention to the soil, for there remains no vestige of any attempt at cultivation. And yet there is under British jurisdiction one thousand square miles of land well adapted to almost every description of tropical crops, and which almost wholly remains in a state of nature. Around the town of Malacca, for a few miles are extensive paddy fields planted chiefly by Malays, but elsewhere not a plantation is to be found. The Chinese, natives of the place, who resort to Singapore in search of fortune, and who as merchants, shop-keepers, and brokers, are the life of that commercial town, after a successful career return, whilst yet under middle age, to their *Elysium*, their beloved Malacca, to pass the remainder of their lives. But here they are as inactive as they were stirring at Singapore, and instead of seeking occupation by investing a portion of their wealth in rearing plantations of spices, sugar, paddy, or any thing else (for there is at present no commerce in the place), they build splendid dwellings in a close and crowded district of the town, and in an impure atmosphere the remainder of their days are passed without following any serious occupation. Such is Malacca at this day, in an agricultural point of view.

The hard conditions formerly imposed by the East India Company on their tenants, as has already been stated in the first part of this paper, kept back European enterprise at Singapore as at the other end of the Straits. But however, a few Europeans and many Chinese ventured to make settlements in the interior of the island, hoping for a more liberal policy.

The Chinese undertook the growth of gambier and pepper, and gradually have extended themselves over a considerable portion of the island. But they are evil doers rather than doers of good to the land, which after a few years' cultivation they abandon, impoverished and overrun with *lalang* grass, and remove to a fresh clearing in the jungle, where the virgin soil becomes in its turn exhausted and a nuisance.

The emigrants from China who yearly arrive here are of the very lowest classes of laborers in their own country, and for the most part enter into engagements with their countrymen already established here to labor for one year, in consideration of the payment of their passage money hither. At the end of the year, if perchance they have not quietly emancipated themselves before, they are free to do as they please, and as they are mostly taken up by the gambier and pepper planters, they usually bargain with a Chinese shop-keeper in Singapore for money and provisions to enable

them to set up with, pledging the future plantation and its products on conditions highly favorable to the capitalist. After having found a suitable location they squat upon it, not unfrequently without even applying for a license or cutting paper from the local authorities, a clearing is soon made in the forest, a part is planted in gambier and a part in pepper, the fallen trees being preserved for future use in boiling the leaves of gambier into a strong decoction, which on cooling hardens somewhat in appearance to soap. Now the pepper vine, to be vigorous and productive, requires a good deal of manure, and the exhausted leaves of gambier are carefully preserved to be afterwards deposited at the roots of the pepper vines, and this is the only manure they receive, while to the gambier plants none whatever is given. The ground is gradually impoverished; becomes less valuable; *lalang* soon begins to show itself among the plants; as the cultivator is not the proprietor, but a squatter, and as he has abundance of fresh ground at hand, and believing it to be more for his interest to begin a new plantation than to be at the expence of procuring manure to keep the old one in good order, it is not a matter of wonder that he should remove from place to place, and, as the locusts, leave a tract of desolation behind him.

The Europeans who commenced plantation of nutmegs, cocoanuts, and sugar-canes, have been put to great expence in extirpating the *lalang* left by the Chinese who preceded them, and as their pernicious practice is still continued, the heavy outlays required to put the ground in a fit state for planting will tend to discourage and retard European enterprise.

There are several extensive estates of nutmegs owned by Europeans in the island in a very thriving condition, and more are yearly added. The spice grows best in the red soil of the hills, and to increase the products, large quantities of rich manures are given to them, once in two or three years.

The great attention the trees receive in the Straits has a very beneficial effect on the nuts, which are large and of a much esteemed quality in the markets of the west.

No success has attended repeated trials of cloves here; until the trees reach the age of bearing they grow and look extremely well; but any expectation of a crop that may have been raised by their hitherto fine condition ends in disappointments, for just then the trees assume the appearance of sudden blight as if lightning stricken, and they die.

Cinnamon is much more successful, for wherever planted it grows most luxuriously, but as no one has yet made a business of preparing it for the market, its quality remains unknown.

The article which, next to nutmegs, has arrested the attention of Europeans, is the cocoanut tree, of which there are many extensive plantations in a very flourishing condition, holding out favorable prospects to the

proprietors. Hitherto the island has been supplied almost wholly from abroad with nuts and oil for its consumption, which will before long be obtained from her own soil.

Sugar cultivation was commenced on the island ten years ago, and has remained stationary since, for the two plantations then commenced remain still the only ones. The cause of this pause may be mainly attributed to the higher rate of duty charged in Great Britain on the Singapore grown sugar than on that manufactured in other British Colonies, and this heavy difference is imposed because foreign sugar, like every other article of commerce, is freely admitted into the port, as if it could not easily be ascertained and certified by the local authorities of the place which is the genuine production of the island. Another cause for its non-progress is the want of adequate capital to carry on the business on a large scale. From the beginning an impression has prevailed that neither the climate nor the soil were favorable to the cane, consequently no money facilities are obtainable in the shape of advances on growing crops or time loans. But to those acquainted with the matter the objections alleged will appear to be mere prejudice unsupported by facts, for if, in taking note of the climate, neither long protracted droughts, nor continuous seasons of wet, are heard of, nor hurricanes, nor typhons, and if a soil changing from red clay more or less mixed with sand, to fields of peat overlaying beds of blue clay filled with marine shells of various sorts be observed, if the observer does not class this soil as the very best, he will be apt to pronounce it, at least, good; more particularly if, on proceeding with his observations, he sees continuous fields of canes measuring from six to eight feet in the stem; which, when ripe and expressed, yield a fair quantity of juice, marking from 9° to 11° of Baume's saccharometer. A practical observer will not be apt to issue a decree of condemnation against the cultivation when, besides, he ascertains that the natural circumstances of the country allow of the taking of two full crops in two years: viz., one of planted canes in fourteen months, and one of rattoons in ten months; and neither the quality of the sugar or rum obtained from the canes will lessen the favorable opinion he may have formed; for the sugar he will observe in the London price current classed with that from Jamaica, and obtaining in that market the same price, and the rum his own judgment will place on an equality with that from the above-named island, and no doubt would be equally valued in the home market if its sale for consumption there was allowed. But the foreign duty is charged on it which amounts to a prohibition. Singapore being thus circumstanced, it ought not to appear extraordinary that sugar cultivation has not been progressive.

Although indigo is extensively used by the dyers of cotton fabrics here, yet it is little cultivated in the island, where it might be produced extensively, for the seeds thrive luxuriantly and abundantly wherever sown. Three crops have been reaped in a small experimental field sown with

Bengal seeds, and probably, with more attention than the experiment received, four cuttings might have been had in the year.

Singapore is celebrated for the great abundance and excellence of its pine-apples, which may be obtained during nearly the whole year, and from which, if the accounts published from time to time of the value of the silky thread obtained from the leaves* are to be depended upon, a valuable article of export might be gathered.* The small circumjacent islands, are quite covered with fields of this plant; the fruit only is of any value to the Chinese cultivators, whilst hundreds of tons of the leaves are annually allowed to waste by slow decay on the ground.

Some notice has already appeared in the Journal, of Gutta Percha,† a new product from the Straits, which has attracted much attention, and which daily becomes an article of greater commercial value.

The forests of Singapore have been pretty well cleared of the tree which the Malays cut down in order to come at the milky substance which, when boiled in water, turns into this solid substance, and the same imprudent and reckless people are now ransacking the woods of the Peninsula with every prospect of destroying the last remnant of the tree before long.‡

Many specimens of other products of intertropical regions are to be seen in a thriving condition in the Straits, leading to the conclusion that, if attended to on a large scale, adequate qualities would be obtained. Coffee alone is said not to be remunerative, owing, as is alleged, to the wetness of the climate which keeps the tree in a bearing condition all the year round, thereby decreasing its productiveness. It is certainly true that the trees yield fruit with very short intermissions throughout the year, but how far this objection is valid is not so clear as the same objection might be made to nutmeg trees, which also are in constant bearing, but nevertheless yield abundantly. It remains yet to be seen, what has not yet been tried in the Straits, whether the cultivation of coffee under the conditions required in other countries, viz. : in rich, virgin, hilly soil, and protected by the foliage of larger trees from the burning rays of a vertical sun, will not give, more especially in the interior of Malacca, the returns usually obtained from the plant in other places.§ The few trees planted here and there produce

* A small quantity is annually prepared and exported to China, as we accidentally discovered some time ago. Some notes which we made on the subject will be given in the Journal.—Ed. J. I. A.

† *Ante*, Vol. i. pp. 22, 261.

‡ But see the remarks *ante*, Vol. i. p. 263.—Ed.

§ An experiment of the kind was made in Penang, and so long as the constant attention which such experiments require, could be given, it was quite successful. The ultimate result is still uncertain. We hope that our local readers will favor us with accounts of all such experiments. There is not a cultivated plant in the Straits of which the habits and culture have been fully described, and no contributions would be more interesting and useful than accounts of these. We are promised papers on the nutmeg and cocoanut, and we hope all our other cultivated trees and plants will be successively described by gentlemen who have given their attention to them.—Ed.

beautiful small blue beans, the quality the most in favor in commerce, which makes it to be regretted, that as yet no serious and well directed attempt has been made to cultivate it extensively.

Sanguine expectations were at one time entertained of raising cotton on the island, and considerable expence was incurred in giving it a fair trial. But the magnificent reports of coming crops sent to the Agricultural Society of Bengal, and the cheering reports of the London brokers to whom trifling samples had been sent, were doomed to a short life, for although the cotton plants of almost every known species were tried, and grew well, still they yielded but few pods, and these were for the most part mildewed, and consequently not merchantable.* The fact is, the climate is too damp generally for maturing a fibrous and delicate substance, requiring continuous dry and hot weather.

But as has been already observed, agriculture has scarcely been introduced in the Straits. What little is done in planting is done without reference to art or science. The hoe is the implement in universal use, slow and expensive, whilst the rapid and economical plough is wholly overlooked. Neither is the composition of manures attended to. But wherever fish, or bat-guano, or a dead horse or an old cow is to be readily got, it is carted to the field and immediately applied as a fertilizer, without admixture and decomposition with other nourishing substances, by which the quantity would be increased a hundredfold.

The time is, however, fast approaching when enterprise and skill will reach the Straits. Its fertile soil, its rich and abundant tin and gold, its fine rivers opening extensive and frequent communication with the interior, the facility of obtaining cheap labor from India and China, and above all, its temperate and very healthful climate, will invite settlers, who, undertaking agriculture as a business, will avail themselves of the improvements of the day, and not let them remain as now, a dead letter.—*Journal of the Indian Archipelago, for March, 1848.*

* A full account of this attempt to introduce cotton would be highly valuable. All such experiments, whether successful or unsuccessful, have a permanent importance, not only for the Settlements, but for the extensive adjacent countries which partake in similar general conditions of climate.—*Ed.*

Result of a trial made at the Society's Garden on a small assortment of Cereal Grain Seeds and Flower Seeds, forwarded by Dr. ROYLE.

In the early part of February 1848, the Society received from the India House, by overland conveyance, two assortments of grain seeds and one of flower seeds: of the former one box was placed in the hold of the steamer, the other was taken charge of by Dr.

Falconer, and kept in a loose airy portmanteau in his cabin, nearly all the voyage, after crossing the Bay of Biscay; with the view of ascertaining how their germination would succeed as compared with those sent in the closed mail boxes. The flower seeds were also entrusted to Dr. Falconer's care, and placed in the same box with the cereals. No time was lost, on receipt of these seeds, in sowing them, and the following statements, drawn up by the Society's gardener, show the comparative results:—

ENGLISH CEREAL GRAINS.

Names.	Date of sowing.	Date of germination.	Number of seeds germinated up to this date.
<i>Cereals kept in the Cabin.</i>			
Sprat or Battledore barley, ..	Feb. 21st,	Feb. 27th,	1st March, 92 $\frac{1}{2}$ cent.
Common rye or Bere ditto, ..	"	"	29th Feb., 98 ditto.
Italian ditto,	"	" 25th,	" 94 ditto.
Victoria Bere ditto,	"	" 26th,	" 91 ditto.
Common winter ditto,	"	" 25th,	" 93 ditto.
Rattling Jack wheat,	"	" 26th,	" 85 ditto.
Bengal spelta ditto,	"	" 27th,	" 53 ditto.
Chiddam ditto,	"	"	" 93 ditto.
Caucasian ditto,	"	" 26th,	" every seed.
Ishmael white-bearded ditto, ..	"	"	1st March, 93 $\frac{1}{2}$ cent.
10 kinds, averaging 79 $\frac{1}{2}$ cent.			
<i>Cereals kept in the mail boxes.</i>			
Oat,	Feb. 21st,	Feb. 27th,	1st March, 35 $\frac{1}{2}$ cent.
Wild grained ditto,	"	" 28th,	" 60 ditto.
Dutch early ditto,	"	" 26th,	" 70 ditto.
Victoria Bere barley,	"	" 25th,	29th Feb., 94 ditto.
Sprat or Battledore ditto, ..	"	" 26th,	1st March, 88 ditto.
Italian ditto,	"	"	" 49 ditto.
Common rye or Bere ditto, ..	"	" 25th,	28th Feb., 99 ditto.
Caucasian wheat,	"	" 26th,	29th " 94 ditto.
Rattling Jack ditto,	"	" 26th,	29th " 94 ditto.
Ishmael white-bearded ditto, ..	"	"	1st March, 67 ditto.
Bengal spelta ditto,	"	" 27th,	" 61 ditto.
Chiddam,	"	" 25th,	29th Feb., 98 ditto.
12 kinds, averaging 75 $\frac{1}{2}$ cent.			

ENGLISH FLOWER SEEDS.

Names.	Date of sowing.	Date of germination.	Number of seeds germinated up to this date.
1 <i>Godetia rubicunda</i> , ..	Feb. 22nd,	1st March,	15th March, 23 per cent.
2 <i>Malope grandiflora</i> , ..	"	27th Feb.,	" 46 ditto.
3 <i>Clarkia pulchella</i> , ..	"	4th March,	" 18 ditto.
4 <i>Rhodanthi Manglesii</i> , ..	"	10th March,	14th " 3 ditto.
5 <i>Godetia lepida</i> , ..	"	29th Feb.,	15th " 64 ditto.
6 <i>Gilia tricolor</i> , ..	"	25th "	" 71 ditto.
7 <i>Calliopsis Drummondii</i> , • Texas, ..	"	1st March,	" 26 ditto.
8 <i>Collinsia bicolor</i> , ..	"	2nd "	" 11 ditto.
9 <i>Ribes sanguineum</i> , ..	"	"	None.
10 <i>Fedia grandiflora</i> , ..	"	29th Feb.,	15th March, 36 ditto.
11 <i>Dianthus barbatus splendens</i> , ..	"	"	" 54 ditto.
12 <i>Viscaria oculata</i> , ..	"	"	None.
13 <i>Collinsia grandiflora</i> , ..	"	7th March,	" 3 ditto.
14 <i>Hibiscus Africanus</i> , ..	"	27th Feb.,	" 33 ditto.
15 <i>Clarkia elegans</i> , ..	"	3rd March,	" 35 ditto.
16 <i>Lupinus pubescens</i> , mixed,	"	29th Feb.,	" 39 ditto.
17 <i>Lobelia gracilis</i> , ..	"	2nd March,	" 20 ditto.
18 <i>Polemonium coeruleum grandiflorum</i> , ..	"	3rd March,	" 25 ditto.
19 <i>Verbascum Phœniceum</i> , ..	"	2nd "	" 78 ditto.
20 <i>Collomia coccinea</i> , ..	"	3rd "	" 5 ditto.
21 <i>Pentstemon ovatus</i> , ..	"	"	" 17 ditto.

Averaging 32 per cent.*

A. & H. SOCIETY'S NURSERY, H. C. BOT. GARDEN :

16th March, 1848.

NOTE BY DR. FALCONER.—On this occasion, the average results are very favorable ; in both cases the difference is in favor of the seeds brought out in my cabin, as compared with those enclosed in the mail boxes : but it is so inconsiderable, (79 : 75 per cent.) that the amount is fairly within the range of the ordinary contingencies of germination. I observe, that all the flower and shrub seeds have come up except *Viscaria oculata* and *Ribes sanguineum*. The failure of the latter appears to be a constant occurrence. I have often had it sent to me from the India House, but I do not remember having succeeded in getting it to grow.

*Mode of preserving grain in the Nerbudda Valley. Communicated by
Col. J. R. OUSELEY.*

On the banks of the Nerbudda, wheat is kept in *bundehs* or pits, containing from 500 to 2,500 maunds. They are shut up soon after the harvest, and covered over with earth; the bottom, sides, and top being lined for six inches with *boosah*, or chaff, retained between leaves and the earthen sides. The leaves are dried and put up on edge, filling in the chaff between the earth and the leaves as the wheat is filled in, the depth about from 5⁶ to 7 feet, and in proportion wider as the *bundeh* may be required for more or less grain. If unopened it keeps without being attacked by any insects, or becoming tainted, for several years; but fresh wheat is used for sowing. A high dry place is always selected for a *bundeh*, which has no other roofing than the earth piled several feet, and beaten down in a conical form, so as to allow of the water running off. Here and there a thatch is put over the *bundeh*. Boot-gram is also kept in the same way, and other grain.

Recipe for preventing the ravages of the Corn-Weevil.

TO THE EDITOR OF THE ECONOMIST.

SIR,—Your correspondent enquires how to destroy the weevil. Our case may be useful to him. Some years ago, we found a house overrun with weevils; after numberless attempts to destroy them, we were led to observe, that they were almost entirely on the south wall (our rainy side), and that they appeared to breed in incredible numbers in any unusually damp spot or corner. Taking the hint, we cased the wall on the outside with slate, and made the house in every respect, perfectly dry, and in a short time the weevils died off and disappeared. Since adopting this precaution, we have not had the least trouble, and have only been reminded, that such an insect exists when an accidental spot of damp has appeared to generate them again. We think ourselves, therefore, entitled to say, that these insects require moisture, and that if the grain and granary, as both ought always to be, are dry and healthy, weevils will not long remain. This plan has the merit of costing less than nothing, because the injury that corn sustains directly from damp, is more than equivalent to the expence of keeping premises dry, leaving its indirect influence in the generation of weevils out of the question,—we are your obedient servants.

WIVELISCOMBE, SOMERSETSHIRE :

W. & W.

October 5th, 1846.

THE JOURNAL

OF THE

Agricultural & Horticultural Society

OF

INDIA.

Notices regarding the plants yielding the fibre from which the Grass-cloth of China is manufactured. Communicated by
DR. D. J. MACGOWAN.

[In consequence of communications received last year from Dr. Campbell, Superintendent of Darjeeling, and Mr. T. F. Henley, (v. Journal, Vol. vi. part 1, p. 30) respecting the superior character of the fibre of the *Kunchoora* of Rungpore, (*Urtica tenacissima*, Roxb.) in which some observations were made regarding its probable identity with the plant yielding the material for the well known and valuable "grass-cloth" of China,—the Society was induced to refer the matter to Dr. Macgowan, at present stationed at Ningpo, to whose obliging kindness it is indebted for the following interesting particulars, which have been obtained partly by correspondence with scientific friends in other parts of the empire, partly by consulting botanical works and enquiring among the natives, and also from personal observations. It is worthy of remark, that the Society's museum contains several specimens of the fibre of *Urtica tenacissima*, in various stages of manufacture, received from Assam and Cachar, where it is known by the name "*Rheea*;" from the Shan country, where it is called "*Pan*;" and from Ava and the Tenasserim provinces. The plant is commonly met with in those countries; and it is also found in the Straits' Settlements, where it is called "*Ramee*."

(v. Low's work on Penang and Province Wellesley.) All the correspondents of the Society, from whom specimens have been received at various intervals during the last ten years—Major Jenkins, Mr. Landers, Colonel Burnes, and Major Macfarquhar, speak in the same terms respecting the great strength, durability and fineness of this fibre. The Shans are stated to use it for every kind of cordage, but the Assamese and natives of Rungpore and Dinagopore, employ it merely for manufacturing into towing lines and fishing nets. The success which has attended the experiments made in Leeds and other towns in Great Britain to manufacture cloth from a mixture, in about equal proportions, of Chinese grass and sheep's wool, having led to a great demand for the former article, in a raw state, it becomes an useful subject of enquiry whether the *Kunchoora* of Rungpore, and *Rheea* of Assam, could not be made a profitable article of export in competition with the China material.]

To JAMES HUME, Esq., *Honorary Secretary to the Agricultural Society.*

SIR,—The inquiries you have done me the honor to propose in behalf of the Agricultural Society of Bengal, respecting the plant from which “grass-cloth” is manufactured, embrace more than can be satisfactorily answered at the present time. The subjoined account, though meagre, and in several particulars incomplete, will be found to contain much of the information you seek. It is cultivated in this vicinity, but as it is of an inferior quality, and does not flower until autumn, my description is less complete than if written in a more favored locality, or at a more advanced season of the year.

Description and History.—Grass-cloth is manufactured from the fibres of a plant, called by the Chinese *Má*; it is a generic term, under which several varieties, if not species, are included, amongst these the *Tung Má*, *Pi Má*, *Sing Má*, *Tien Má*, and others are used only as therapeutic agents. Cloth is manufactured from the *Chú Má*, *Tá Má*, *Kin Má*, *Luh Má*, &c. There is also a species of grass-cloth made from the *Kóh*: all these have likewise a place in the pharmacopœia of China. In imitation of the native botanists from whose works this account has been mainly derived, I shall principally limit my remarks to a description of the *Chú Má*, which belongs

to the natural order of *Urticeæ*—it is a *Cannabis* or hemp, but differing from *Cannabis sativa*, sufficiently to warrant another designation. Perhaps until it becomes better known, it may be called *Cannabis sinensis*. It has an irregular cellular root, of a yellowish-white color, which sends up annually ten to fifteen, or more stems, to the height of from 7 to 10 feet. The stems are upright, slightly fluted, pilous, and herbaceous: its leaves are on long petioles, alternate, ovate, roundish, serrate, simple; the upper surface pilous and dark green, the lower of a silvery-grey. The flowers are described as minute, numerous, of a light green color, on a catkin-like receptacle or spike. It is found at the base of hills and on dry soils, from Cochin China to the Yellow river, and from Chusan to the farthest west that researches can for the present extend, and abounds chiefly in Kiangsú, Sy, Chuen, Kongnain, Chikiang, Fuchien, and Canton provinces. Native writers do not include the latter province as its region. It is certainly remarkable, that there is no notice of the *Má* in the work to which you refer, [Fortune's Wanderings in China] as it is cultivated extensively in many places visited by the author, and grows even on the walls of Ningpo. The plant is mentioned in the Chinese classics, and was undoubtedly cultivated and employed by them a thousand years prior to our era. It is mentioned in the *Shú King* as an article of tribute from the central part of China in the time of Yu, B. C. 2205: doubtless it came into use in far more remote antiquity. The Chinese *Herbal* says, "its origin is unknown."

Medical properties.—The root is described by writers on materia medica as innoxious, sweet to the taste, of a cold nature, and possessed of cathartic properties. The root, seeds, and leaves are all officinal. A long list of diseases are enumerated in which the plant is efficacious, but these throw no other light on its properties than to suggest it is comparatively inert. It is partly because of its not possess-

ing the narcotic properties of the *Cannabis sativa*, that a difference is presumed to exist between them. In this connection I may remark, that grass-cloth is superior to linen for garments in hot climates, the latter being a rapid conductor of caloric is often unsafe, the former is not so good a conductor, and therefore more suitable. This may be owing either to the fact of the former being hot-pressed in a calender by which it is rendered compact and smooth, whilst the process to which the other is subjected for the same purpose, but partially affects it, or original differences in the fibres of European and Chinese linen.

Planting the seeds.—This takes place in May. Great care is first taken in the selection of seeds, and in the preparation of the soil. The seed should be gathered on the appearance of frost, those produced from a recent root are the best. After being dried they are stowed away in a basket or jar mixed with sand, or dry earth, others say moist earth. The jar is then covered with straw to protect the seeds from the cold, as if exposed to its influence they yield an imperfect plant. Before planting, the seeds are tested by immersion in water, those which float are to be rejected, those at the bottom to be planted. A loose dry soil is to be selected, if near a canal or rivulet it is preferable. The ground is to be well ploughed, and broken finely, manured, and then divided into beds about eight yards long, and one wide; the beds are to be raked, and afterwards made compact with a hoc. After this it is watered and left for a night: on the following day raking up and pressing down is repeated. The beds being smooth, two or three table spoonsful of seed are mixed with a bowl of earth, and sown broad-cast over half a dozen beds, then they are swept with a broom to cover the seeds. In some places the seeds are first made to sprout, and then planted in drills, which are carefully filled up. Just before the blades appear, a framework is to be constructed over the beds, on which mats should be spread to protect them from

the heat of June and July. The matting must be kept moist by day and removed at night, that the blades may receive the dew of heaven. The beds are to be constantly weeded. When the plant is about two inches high, the framework and matting may be removed. When three inches high, it should be transplanted, having been well watered the night before; the blades should be taken up separately with a portion of earth and planted in a field far removed from mulberry trees, about four inches apart. It may form a border to the cerealia and vegetables, protecting them from the depredations of domestic animals, which all avoid the *Má*. In dry weather, the field is to be watered every three or four days, until the second decade, when it may be watered every tenth day. In November and December manure it with horse or buffaloe dung, earth, straw or any rubbish, a foot or more thick, to protect it from cold. In March rake it away and expose the plant, watering it in dry weather, and using rubbish of any kind for manure. A caution is given never to use swines' dung, as it is "saltish" and hurtful to the *Má*. In the third or fourth year, some say in the second, the plant may be cut and used.

Planting the roots.—The roots are to be cut into pieces of three or four fingers' length, and are to be planted in May, half a yard apart, and watered every three or four days. On the appearance of the blades use the hoe and water them; they will be mature for cutting in the second year. In the course of ten years the roots become unfruitful, the shoots may then be cut off, and if enveloped in earth, and covered with matting, can be transplanted in places 30 or 40 inches distant. The ground should be first well prepared with manure, and freely manured afterwards: the manure being half water. Here, as before, the plants should be hoed from time to time. In many cases fresh earth, pulverized bricks, ashes, &c., are used for manure. Some years the husbandman has his crop injured by worms, he needs therefore to seek for

and destroy them as they appear by picking them off. It not unfrequently happens, that the crop is in some places remarkably small, and sometimes the produce is very great without assignable cause.

Cutting the Má.—It yields three crops every year. The first cutting takes place in June. Care is to be taken not to cut the young shoots, keep therefore an inch from the ground. In a month or two, the shoots are seven or eight feet high, when the second cutting takes place: do not cut the original stem. During the latter part of September, or in October, the last cutting is performed, from which the finest cloth is made: the first being inferior, coarse, and hard. After each cutting, the plant is to be covered with manure, and watered; but not day by day unless it be cloudy. At Canton the plant is pulled up by the roots every year, from which it is evident that it differs widely from the *Má* just described. Perhaps that which is produced at Canton is *Cannabis sativa*.

Peeling the Má.—On being cut, the leaves are carefully taken off with a bamboo knife, by women and children, generally on the spot. It is then taken to the house, and soaked in water for an hour, unless it is already wet by recent showers. In cold weather the water should be tepid. After this the plant is broken in the middle, by which the fibrous portion is loosened, and raised from the stalk; into the interstice thus made, the operator, generally a woman or a child, thrusts the finger nails, and separates the fibre from the centre to one extremity, and then to the other. The stripping process is very easy. It appears to be difficult to remove the fibres from the Canton *Má*, as it is soaked in water for more than 48 hours before peeling, which is done by men. They first cut off the roots, and then separating the fibre from the stalk, strip it off by drawing it over a pin, fixed in a plank. In either process half of the fibre is taken off at one stroke. The next process is scraping the hemp, to facilitate which the fibre is first soaked in water. The knife or scraper is

about two inches long; its back is inserted in a handle of twice the length. This rude implement is held in the left-hand, its edge which is dull, is raised a line above the index finger. Strips of hemp are then drawn over the blade from within outwards, and being pressed upon by the thumb, the pilous portion of one surface, and the mucilaginous part of the other are thus taken off. The hemp then “rolls up like boiled tendon:” after being wiped dry, it is exposed to the sun for a day, and then assorted, the whitest being selected for fine cloth.

Bleaching and dividing.—A partial bleaching is effected on the fibres, before they undergo further division, sometimes by boiling, and at others by pounding on a plank with a mallet. These operations are in some places repeated. After being dried in the sun, an important operation then succeeds by women and children, to whom is entrusted the tedious process of splitting the fibres, which they do with their finger nails. Expert hands are able to carry this division very far. When this process has been preceded by hatcheling, the shreds are finer and softer. The threads are formed into balls, and subjected to frequent soaking and washings. The ashes of the mulberry leaf are recommended to be put in the water with the hemp, others use lime, for a whole night. Some simply expose it to dew and sun. In rainy and cloudy weather, it should be exposed to a current of air in the house: moisture darkens it. The threads are now ready for splicing, the work of women and children, the labors of the agriculturist being concluded when the threads are rolled into balls, after being sized or stiffened with rice-water. Before the thread is ready for the weaver, the balls are steamed over the vapour of boiling water in a closed oven. They are then spread out to dry. The subsequent stages, until the cloth is removed from the loom, include nothing which interests, or at least instructs, artisans in the West.

Varieties of the Má.—The *Chú Má* is found wild, but in this state attains only three or four feet, and is seldom used except for twine. *King Má* grows nearly as high as the *Chú Má*, the fibre is separated only by rotting in water. The stalks are dipped in sulphur and employed for matches. Its flowers are yellow. Very coarse cloth and sandals are made from its fibre. The thread of this *Má* made in *Kongsi*, is said to be as fine as silk. *Tá Má* or *Hán* (dynasty) *Má*, and also called fine hemp, is likewise employed for making cloth and for ropes; its fibre is used as a support to the pith employed as candle wicks. *Luh Má* produces the hemp of which rice bags are manufactured, and also ropes. The *Tung Má* and the *Pi Má* are used for making pigments, one serving for cakes, the other for paper. The only other *Má* that need be named in this list is the *Chí Má*, *Sesamum indicum*. It was brought from India in the reign of Kingti, B. C. 156. It is now found in all parts of the empire. Its seeds are used in cakes, and like almost every kind of *Má*, it yields oil.

Flax.—It would seem from various English and Chinese Dictionaries, that flax is found in China, but of the existence of *Linum usitatissimum*, I cannot discover the slightest evidence. It seems to have been confounded with the last named plant. The above are all the facts respecting the *Má* which I have been able to glean from native authors, the deficiency can only be supplied by personal observation. The *Chú Má* of this place can be inspected and described when in flower. This imperfect account of the plants producing the fibre from which the grass-cloth of commerce is manufactured (evidently a misnomer), would be yet more defective were the *Kóh* plant to be wholly omitted. It is described as a creeper, which every year springs from an immense root, and grows from ten to thirty feet in length, clinging to trees when within reach. The root is purple on the outside, and white within, it is made into flour like arrow-root. I have found it an useful substitute for the

Maranta arundinacea. Its leaves have three points, they are long, green on the face, and bright below. In August it has blended purple flowers. The fibre is strongly adherent to the stalk, and is only loosened by boiling it in water. It is then taken off with the finger nails, exposed for a long time to running water, and beaten with mallets. It undergoes the same processes as the *Má*, but seems to require more beating and boiling: wooden utensils make it dark. The *Kóh*, like the *Má*, has been manufactured from high antiquity, and is found throughout the same extensive region in which the latter abounds. The cloth made from it is *yellow*, and as fine as ordinary grass-cloth, it cannot be bleached white, in summer it is much worn by respectable Chinese. The best brought to Ningpo, is called *Háinán Kóh* cloth, and is perhaps manufactured on the island of Háinán. If by the *Kunkhura* you mean the *Urtica tenacissima* of Roxburgh, it is probable that it is a different plant from either variety of the *Má*. As the hindrance to the manufacture of the former is owing to the difficulty attending the peeling of the fibre, would it not be well to treat it, as the Chinese do the *Kóh*, viz. by boiling? If the *Kunkhura* should prove useless, may not the catalogue of Dr. Wallich, which contains forty-seven species of *Urticeæ*, include the *Má*, the *Kóh*, or an available substitute? The observations of Dr. Roxburgh, on the various specimens of fibrous vegetables, the produce of India, may perhaps be consulted with advantage in connection with the Chinese account of the *Má*. Besides the enclosed, I shall only be able to send you some seeds of the *Chú Má*. There can be no doubt that if seeds of the proper kind be procured from China, the plant may be introduced into India if it be not indigenous to her soil. To secure success it would perhaps be well to procure them from each of the open ports of China. From Canton is exported the finest cloth manufactured in the empire. This superiority the Chinese attribute to the greater skill of the Canton workmen. Foreigners have refer-

red that fibre to two plants, *Cannabis sativa*, and *Sida tilafolia* (Dr. Abel).* From Shanghai is exported the fine strong fibre you have referred to, the *Urtica nivea*. It was through the efforts of the H. E. I. Company of Canton, that seeds were procured and forwarded to England. By referring to the 47th page of the 72nd Vol. of the Philosophical Transactions, there will be found a paper on Chinese Hemp by Mr. Furgusson, and a notice of the experiments tried with the seeds in England, (vid. Encyc. Britannica). Had they possessed the hints here extracted from Chinese writers on this plant, the experiments of the gentlemen named in the above paper would probably have been more successful. Should the Society wish to pursue the subject further, some useful information may be obtained from a series of sketches, 120 in number, illustrating the culture and manufacture of grass-cloth, by Tinquá, 12, New China St., Canton, a translation of the text accompanying the drawings may be found in the Chinese Repository for May 1847. It was the special province of Monsieur Hedde, of the late embassy from France to China, to collect facts and specimens illustrative of the agriculture and manufactures of China. The result of his observations have, I believe, been published in Paris, containing a notice of one variety of the *Má*. Osbeck, a pupil and countryman of Linnæus, and Dr. Abel, Naturalist of Lord Amherst's embassy, have noticed the *Má*. The Agricultural Society of Bengal, aiming to develop the industrial resources of a great empire, and thereby to improve its inhabitants, has a claim upon the services of all who can contribute in any manner to its objects. Allow me to assure the Society, that I shall take great pleasure in responding to any further calls you may have occasion to make.

Ningpo : June 1st, 1848.

It has also been referred to *Corchorus capsularis*. Vide Bennett's *Wang* in N. S. Wales and China.—EDS.

NOTE BY DR. FALCONER.—As there are no specimens accompanying Dr. Macgowan's paper on the grass-cloth of China, it is impossible to decide as to the accuracy of his statement that the fibre is produced by a species of *Cannabis*, which he provisionally calls *Cannabis sinensis*. This point cannot be determined without an examination of the flowers;* and Dr. Macgowan does not appear to have seen them. But the description given by him is entirely that of the species of *Bæhmeria* (formerly *Urtica*), called *B. nivea* or *tenacissima* by Botanists, or of a nearly allied species; and I am not aware of any evidence to support the idea that the China grass-cloth (*Chú Má*) is derived from a species of *Cannabis*. One of the other kinds mentioned by Dr. Macgowan, *King Má*, was forwarded to Dr. Roxburgh, from Canton, by Mr. Kerr, in 1812.

* A second reference has been made to Dr. Macgowan on this point, and specimens will no doubt be shortly received.—EDS.

Report on the Oil of the seed of the Mahwa tree (Bassia latifolia). Communicated by the Society of Arts.

Adelphi: 13th September, 1848.

J. HUME, ESQ., *Honorary Secretary of the Agricultural Society, Calcutta.*

SIR,—I am directed by our Committee of Chemistry, Trade, and Manufactures, to forward to you the following report relative to the oil of the *Bassia latifolia*.*

The receipt of your parcels of oil having been reported to the Council, the same were referred to a joint Committee for consideration, and the following are the results of the experiments which have been made. An analysis of the oil having been made by W. Hawes, Esq., the following is his report:

* This oil was originally received from Mr. C. B. Taylor, of Palamow, in which district the tree abounds; but it is also common throughout Central and Northern India.—EDS.

"Its specific gravity is .926, in appearance it consists of a number of round crystalline grains of solid matter (stearine), embedded in an oily fluid (elain). It saponifies easily with the production of glycerine and the usual grease acids, but I could not detect lactic acid in the product; the resulting soap is good as to quality and color, and satisfactory as to quantity. .

"The coloring matter in the oil passes off in the spent ley to which it communicates a brown color, similar to that produced by other vegetable oils.

"The grease acids produced after the saponification of this oil are easily separated by pressure, and afford at 40 per cent. of stearic acid, and which is inodorous while translucent, and appears admirably adapted for candles.

"If the oil can be obtained in bulk in the same state as the sample, the solid and fluid parts may be more easily separated than in most oils, and by the simple process of draining, which consists in melting the oil and allowing it to cool in a room, in tubs, heated to that degree which will allow the stearine to crystalize, leaving the elain fluid.

"When the crystalization is perfect, a plug in the bottom of the cask is removed, and the elain drawn from the solid mass, and two beautiful products are obtained.

"The elain obtained in this process from tallow is fitting for soap-making and other rough purposes. From palm oil it is too much colored to be applicable to many uses, but that obtained from this oil is superior to either, and in its appearance and properties resembles olive oil, and I think for many purposes would be as useful, especially for dyeing.

"From the examination of the oil, which I have been able to make, I have no doubt that if it can be produced at the cost of palm oil, any quantity can be used advantageously."

Although Mr. Hawes went fully into the matter, I regret that the Society did not receive any specimens of the manufactured article.

Mr. G. F. Wilson, Managing Director of the Patent Candle Company, also furnished the Society with a report, in which he states, "that the worth of the *Mahwa* oil in this country, for the manufacture of candles, is £ 8 per ton, less than Petersburg tallow, and after making a great number of experiments upon it, he finds it to be of the same value as cocoanut oil, as its being harder makes up for the color being inferior. Large quantities could be used in this country at about £ 35 per ton." I send some of the candles and oil as returned to the Society by Mr. Wilson, but he fears, that they will not remain in a solid state through the voyage to India :* there are however processes by which candles could be made from this oil sufficiently hard for the Indian market. Samples Nos. 1 and 2 in the parcel sent are those by Mr. Wilson.

The oil having been further examined by Mr. John Thomas Cooper and other eminent Chemists, they reported that the sample of oil appears to be similar to the African Sheea butter, except that it is somewhat harder, and it would doubtless be an important introduction into this country if its price would admit of its competing with palm oil.

In addition to the above reports I am directed to inform you, that the Society caused several other experiments to be made with the oil by manufacturers of soap, and sample No. 3, is a specimen made by Mr. R. Hendrie, with a minimum amount of alkali ; and No. 4, a specimen by Mr. Bortram, of soap manufactured by a new process, this specimen is much harder and more compact than the preceding.†

The whole of the parties to whom it has been submitted, agree, that it is likely to be of great importance for most commercial purposes if it can be obtained in bulk at a price not exceeding that of palm oil.

* The candles reached in a half liquified state.—*Ends.*

† These specimens are in the Society's museum, and open to the inspection of the public.—*Ends.*

In conclusion, I am directed to express to you the thanks of the Society for having forwarded to them for their examination, an article likely to be of so great importance both to the country producing and consuming it; and to assure you, that they will, at all times, be most happy to co-operate with you in obtaining reports and assisting in carrying out the objects of your Society.

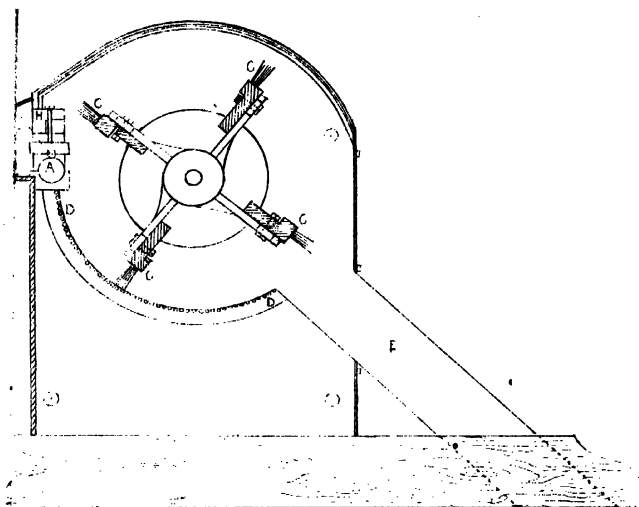
SAMUEL THOS. DAVENPORT, *Asst. Secy.*

P. S.—The above report would have been forwarded some time since, but was delayed in hopes that further specimens would have been forwarded to the Society to be remitted to you,

Report of the Committee upon the Cotton-cleansing Machines ; with a memorandum descriptive of the Machine to which the Society's gold medal and premium of Rs. 500 were awarded.

Your Committee assembled at the Society's rooms, Metcalfe Hall, on the afternoon of Saturday, the 23rd September, and proceeded to settle the mode in which the experiments should be tried for determining the comparative merits of the three cotton-cleaning machines, entered for competition for the gold medal of your Society, and the premium offered by Major Jenkins.

2nd. It was settled, that the native *churka* should be tried in the first instance as a standard of comparison for the competing machines. Also, that the experiments were to consist in passing one-quarter of a pound of *kupas* through each machine, the time which lapsed during this operation to be noted, and the seeds and cotton to be then separately weighed, and lastly, the cotton passed through to be examined for cleanliness, quality of staple, and whether it was



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opened out or clotted. The *kupas* under experiment was from the Agra district, forwarded by the Lieutenant Governor of the North-Western Provinces.

3rd. A native was to pass the cotton through the *churka*, Mr. John Fraser, Civil Engineer, (who undertook at the request of the Society to see that Mr. Burn's machine was in the best possible working order) was to pass the cotton through the machines of Mr. Potter and Mr. Burn, and Mr. Mather was to pass it through his own machine. These preliminaries being settled, the experiments were proceeded with; in the course of our proceedings it was observed, that the scales with which the cotton was weighed were unsuitable for so nice an operation, and upon the fourth experiment being tried, they gave so absurd a result, that a repetition of that experiment was determined on to ascertain if any error had been committed in the weighing. The result of the repetition showed the fault to be in the scales which were not sensitive enough for our purpose, whereupon it was resolved to re-weigh with proper scales the cotton and seeds of each experiment, they being carefully kept apart for that purpose, as well as for examination. The following Table shows the experiments as they stood at the close of the trial:

TABLE I.

No. of Experiments.	Name of Machine.	Weight of Kupa used as per common scales.	Time elapsed in the experiment.	Weight after experiment as per common scales.	
				Of Seeds.	of Cotton.
			M. S.	Rs. As.	Rs. As.
1	Native Churka,	$\frac{1}{4}$ lb.	8 50	6 0	4 0
2	Potter's,	Ditto,	7 50	6 0	4 0
3	Burn's,	Ditto,	6 0	6 0	4 0
4	Mather's,	Ditto,	3 30	6 0	5 0
5	Ditto repeated,	Ditto,	2 58	5 14	4 6

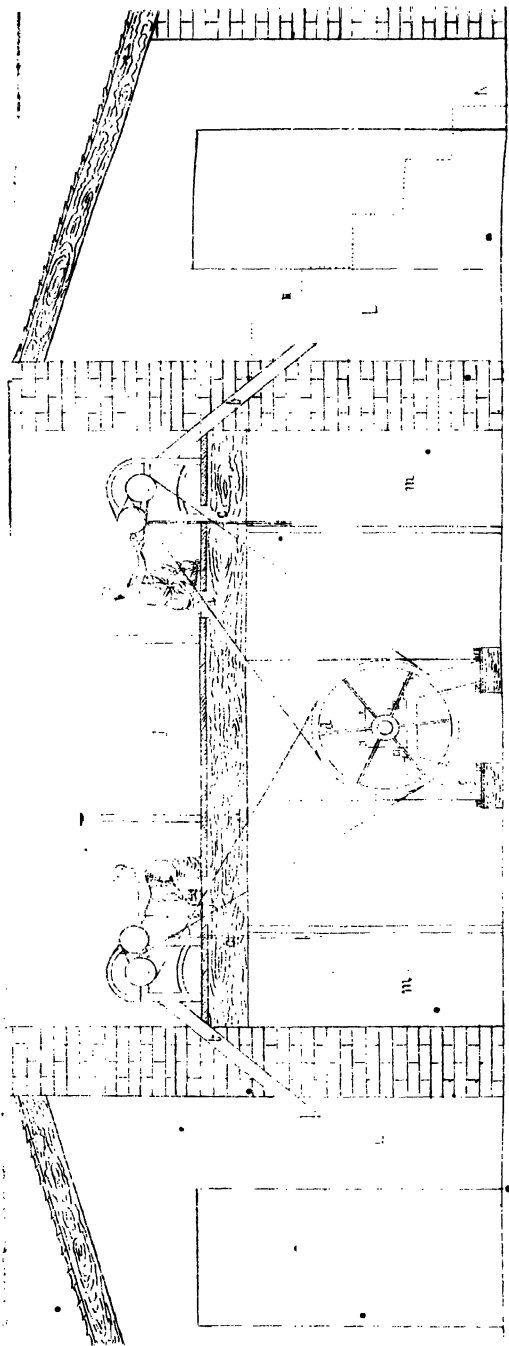
4th. On the 25th instant the re-weighing took place with proper scales, the weights were again taken in Rupees and Annas, and the following Table shows the results :

TABLE II.

No. of Ex- periments.	Name of Machine.	Weight of		Total weight.
		Cotton.	Seeds.	
		Rs. As.	Rs. As.	Rs. As
1	Native Churka,	4 1	6 3½	10 4½
2	Potter's,	3 10½	6 3½	9 13½
3	Burn's,	4 0½	5 14½	9 15½
4	Mather's,	4 13½	6 3	11 0½
5	Ditto repeated,	3 10½	6 0	9 10½

As there was no dirt worth naming in the *kupas* that was experimented upon, except a very few bits of leaves of the plant, which were all weighed either with the cotton or with the seeds, there could have been no loss in the operation sufficient to effect our results, therefore the last column of the above Table shows the weight of *kupas* originally applied to each machine, instead of an even quarter of a pound as given by the imperfect scales ; consequently, it appears that in the 4th experiment the largest quantity of *kupas* was used ; in the 1st experiment the next largest quantity ; and in the 3rd experiment the next largest quantity ; and lastly, in the 2nd experiment the smallest quantity of *kupas* was used, the repetition of the trial with Mather's machine being left out of consideration.

5th. Now, by applying the times noted, as given in Table I. to the true weights, as shown in Table II. and rejecting the repetition of the experiment with Mather's machine, we obtain a correct Table of our experiments as follows :



of feet

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

TABLE III.

No. of Experiments.	Name of Machine.	Time elapsed.	Weight of Kupas used.	Weight of results.			
				Cotton.		Seed.	
		M. S.	Rs. As.	Rs.	As.	Rs.	As.
1	Native Churka, ..	8 50	10 4½	4	1	6	3½
2	Potter's,	7 50	9 13½	3	10½	6	3½
3	Burn's,	6 0	9 15½	4	0½	5	14½
4	Mather's,	3 30	11 0½	4	13½	6	3

6th. By reducing the weight of *kupas* used in each experiment from Rupees and Annas (in which it was taken for convenience at the time,) to its corresponding weight in decimals of pounds; and by proportionately determining what weight of *kupas* each machine would clean in a day of 12 hours, we get the following Table IV. We have assumed 12 hours as the extent of a day's work in our comparison, but for this purpose it matters not how long a time be taken, always provided that the same period be applied to each of the machines to obtain a correct comparative result; comparative and not absolute results being all that is required or can be obtained in the present enquiry. In actual practice it will often happen, that a man having a large family may, with their aid, work his *churka* for a much longer time than a man with a small family, or than one with no family at all, but such considerations are foreign to this investigation.

TABLE IV.

No. of Experiments.	Name of Machine.	Time elapsed.	Weight of Kupas in decimals of lbs.	Weight of Kupas that would be cleaned in 12 hours.	Weight of clean cotton produced in decimals of lbs.	Weight of clean cotton produced in 12 hours.
		M. S.	lbs.	lbs. oz.	lbs.	lbs. oz.
1	Native Churka, ..	8 50	0.257	20 15	0.1016	8 4.50
2	Potter's,	7 50	0.246	22 10	0.0912	8 9.12
3	Burn's,	6 0	0.249	29 14	0.1009	14 1.73
4	Mather's,	3 30	0.276	56 12	0.1212	24 14.77

The above Table shows the out-turn of the several machines, and calling that of the native *churka* 1, or unity, the comparative merits as regards out-turn will be as follows :

Native <i>churka</i> ,	1
Potter's,	1.012
Burn's,	1.462
Mather's,	3.010

By this it appears, that the merits of the machines, so far as out-turn is concerned, is inversely in the order in which the experiments were made. But, with the exception of the native *churka*, it is not to be understood that your Committee consider the above figures to represent the correct out-turn of the machines when working upon a large scale, for the experiments were far too small to determine that point, but were sufficient to fix their relative merits, which your Committee consider was more particularly their business.

7th. There is another point to be considered, namely, that the native *churka* was worked by *one* man only, whereas the other machines were worked by two men turning a fly-wheel, whilst a *third* man fed the machine, making three men ; the out-turn therefore ought to be three times as great as that by the native *churka*, to make the results equable in regard to cost for labor. This we find to be the case in Mather's machine only, and assuming the price of labor per man to be the same for each machine, the relative merits of the two machines as regards cost of working, as shown by these experiments, are very nearly identical, and may be thus expressed :

	Cost of working.	Out-turn.
Native <i>churka</i> ,	1	1
Mather's machine,	3	3.01

It should here be stated, that the cost of Mather's machine is 60 Rupees, that of the native *churka* probably 1 Rupee.

8th. Thus, so far as cost of working and out-turn is concerned, the result by these experiments is the same for the

native *churka* and Mather's machine. It remains now to compare the quality of the cotton after being experimented upon, as respects cleanliness, opening out of staple, &c. The cotton cleaned in the foregoing experiments was submitted to the examination of the two persons named by the Society, and whom your Committee considered as very competent judges, namely, Mr. Edward Smith, a cotton manufacturer from Manchester, and Mr. Marshall, the manager of Fort Glo'ster cotton mills. The packages containing the samples for their inspection were numbered 1, 2, 3, &c., without stating the machine the numbers referred to. The opinions of these gentlemen are given in the Appendix Nos. 1 and 2, and need not be quoted in full here: it being sufficient to state, that they both decidedly gave the preference to the packages marked 4 and 5, which were from Mather's machine. The order of merit they both assigned to the samples was as follows—

1. Mather's machine.
2. Native *churka*.
3. Potter's machine.
4. Burn's machine.

In the opinion of these gentlemen your Committee fully concur. Mr. Smith further states, "that were the Surat cottons, which enter the Liverpool market, cleaned equally as well as the samples 4 and 5 (from Mather's machine), they would bring from $\frac{1}{4}$ to $\frac{3}{8}$ of a penny per lb. more than they now do," which would (taking the average of those sums, namely, 212 of a penny) be an increase in price equal to two shillings and three half pence per maund. And Mr. Marshall's statement nearly agrees therewith, for he says, "its value would be enhanced more than a Rupee a maund, or say on an average 10 per cent." The *kupas* upon which the experiments were tried was, as stated in para. 2, from the Agra district, and was remarkably clean picked, being almost wholly free from bits of leaves, whilst that which is sent

from Surat or from the Nurbudda districts, your Committee believe to have much less care bestowed on it in this respect, and is generally very dirty; and although it is to be regretted, that none of this foul *kupas* could be procured at the time for the experiment, yet your Committee see no reason to suppose that the like *comparative* superiority would not have been displayed by the Mather's machine on the dirty muster as upon that submitted to the trial.

9th. Before coming to a final conclusion upon the merits of the machines, your Committee again tried the experiments between the native *churka* and Mather's machine, using half a pound of cotton to each, both Mr. Potter's and Mr. Burn's machines being now considered as so decidedly surpassed by Mather's, and not performing the work so satisfactorily as the native *churka*, were omitted from further consideration. The following Table gives the particulars of the last trial:

TABLE V.

Name of Machine.	Time elapsed.	Weight of Kupas in decimals of lbs.	Weight of result in decimals of lbs.		Weight of Kupas that would be cleaned in 12 hours.	Weight of clean cotton produced in 12 hours.
			Cotton.	Seed.		
	M. S.	lbs.	lbs.	lbs.	lbs. oz.	lbs. oz.
Native Churka, ..	17 24	0.500	0.192	0.308	20 11	7 15.11
Mather's,	6 20	0.500	0.190	0.310	56 13	21 9.60

Now, treating this experiment in the same way as was done with the former, in paras. 6 and 7, we get the following comparison:

	Cost of working.	Out-turn.
Native <i>churka</i> ,	1	1
Mather's machine,	3	2.719

This result differs from that of the former experiment, and there can be no doubt that, if they were repeated again and again, a different result would be obtained with each repeti-

tion, as such is invariably the case with correct experiments of every kind: the usual course in such cases is to take the mean; if we follow this plan, the mean result of our two experiments between the native *churka* and Mather's machine would be as follows :

	Cost of working.	Out-turn.
Native <i>churka</i> ,	1	1
Mather's machine,	3	2.864

This result would show the out-turn by Mather's machine is less in proportion to its cost of working than that by the native *churka*. But it must be stated, that we have been considering the machine as worked by three men when comparing it with the native *churka*, although this is not the mode intended to work the 12 machines now made for Government (which will be all worked together by animal power), and your Committee consider that no satisfactory result as to the actual working of Mather's machine can be arrived at until tried upon the large scale intended by Government.

10th. If from the foregoing statement and discussion of facts the Society should proceed to deliberate upon the propriety of awarding Mr. Mather their prize, your Committee think it proper to state, it has been suggested that the original cost of Mr. Mather's machine, namely, 60 Rupees, being so much greater than that of the native *churka*, namely, about one Rupee, would, in a measure, be a prohibition to the poor people of this country availing themselves of it. This objection however seems to be over-ruled, as far as regards the prize, by the Society's own proceedings on the 11th October 1847 (vide Journal of the Society, Part 2, Vol. vi.) and 12th February 1848, (vide Journal of the Society, Part 3, Vol. vi.) wherein the Society agreed to admit both Mr. Burn's and Mr. Mather's machines with a knowledge that the cost of the former was £3 to £4 each, and that of the latter 60 Rupees. This therefore would appear to set the matter of the cost of the machine out of the question as

respects the Society's gold medal, but it is not for this Committee to offer any decision upon this point. And with respect to the premium offered by Major Jenkins, we find in Part I, Vol. vi. of the Society's Journal, that at a meeting of the Society, held on 12th May 1847, and also at their next meeting on the 9th June 1847, a correspondence was read from Dr. Wight, Mr. Petrie and Major Jenkins, relative to Mr. Petrie's saw-gin and Mr. Burn's machine, from which it would appear, that Burn's machine came within Major Jenkins' intentions, and if so, Mr. Mather's we presume would also. Nevertheless, your Committee, at the same time that they would recommend Mr. Mather's machine to the favorable consideration of the Society for their medal, consider it is due to Major Jenkins to refer the whole of the case to him for his decision respecting his own munificent premium.

11th. Your Committee think it necessary to state, that they do not consider that Mather's machine, in its present state, is perfect, having no doubt but that gentleman will improve many of its details during the construction of the large additional number he is about to make for the Government for distribution through the principal cotton growing districts of India. Your Committee, at the same time, would guard the Society from the supposition, that this machine, however great an improvement, is likely in the present state of civilization and agricultural progress in India to become an available machine to the cotton growing population: the machine however as it now stands, appears to your Committee to be highly creditable to Mr. Mather's ingenuity and perseverance in its construction, in its workmanship, and in its results; and it is also worthy of notice, that it has been entirely made in India. Should the Society concur in the recommendation of your Committee and award Mr. Mather the prize, they would suggest, that he be requested to furnish drawings of the machine, accompanied with a

paper explanatory of its mechanical details, and also of the manner in which it is intended by Government to fit up and work twelve of them together by animal power, and any other particulars that he might deem of importance.* Your Committee are of opinion, that the publication of such particulars in the Society's Journal would enable others to manufacture the like machines in remote localities, and lead to its being early brought to the utmost perfection it is capable of.*

12th. It may be worth remarking, that all the machines submitted for trial follow the principle of the native *churka* namely, having two rollers through which the cotton is passed and stripped from the seeds, which are rejected and remain (or ought to remain) behind, whilst the cotton is drawn through; so far they resemble each other and the native *churka*; but they differ very materially in the diameters of the rollers, which doubtless has much to do with the success of the machine. The following table shows the diameters of the rollers of each of them :

Table showing the comparative sizes of the rollers of the Native *Churka* and of the three new Cotton-cleaning Machines.

No.	Names.	Diameter of upper roller at its ends.	Upper roller at centre.	Mean diameter of upper roller.	Diameter of lower roller.	Relative proportion of the 2 rollers.
		Inch.				
1	Native Churka, ..	$1\frac{1}{8}$ & $\frac{3}{8}$	$\frac{1}{2}$	$\frac{1}{2}$	$1\frac{1}{4}$ $1\frac{1}{8}$	As 1 to 2
2	Potter's machine, ..	$1\frac{1}{8}$	$\frac{5}{8}$	$\frac{3}{8}$	$2\frac{1}{2}$	1 to 4
3	Burn's machine, ...	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$2\frac{3}{8}$	1 to $3\frac{1}{8}$.
4	Mather's machine, ..	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$1\frac{1}{2}$	1 to 3

Two of the machines, namely, Burn's and Mather's, have the brush-fan applied to them, this application was in all pro-

* It will be perceived, that this recommendation of the Committee, has been attended to.—Ends.

bability copied from the American saw-gin, which is similarly furnished, but this ought no more to be considered as detracting from the merit of either Mr. Burn or Mr. Mather than the application of the crank (which had been in use from time immemorial in the turning lathe and spinning wheel) detracted from the merit of the person who applied it to convert the reciprocating motion of a steam-engine into a rotatory one, for which a patent was granted by the Crown, and which patent was not litigated even by the celebrated Mr. Watt, to whom the application of the crank as above-named would have been of great value.

13th. Before concluding their Report your Committee deem it incumbent on them to express their thanks to Mr. John Fraser, Civil Engineer, for his kind and constant attention to the Society's and their wishes, in seeing that Mr. Burn's machine was in the best possible working order at the time of the experiment, and also in working it during the trial, Mr. Burn having appointed no one to look to his interest during the proceedings; Mr. Fraser likewise most willingly undertook a similar office for Mr. Potter's machine. He being altogether a disinterested party, places, in the opinion of your Committee, the fairness of their experiments beyond the possibility of suspicion. To Mr. Mather also the thanks of the Committee are due for the trouble he took in arranging and fitting up the room for the trial, which he did with the advice and assistance of your able Assistant Secretary, Mr. Blechynden, whose attention and assistance to the Committee throughout their proceedings was of the greatest service.

CALCUTTA:
30th October, 1848.

F. W. SIMMS, *Civil Engineer.*

WM. SAGE, *Lieut.-Colonel.*

J. M. VOS, *Civil Architect & Engineer.*

CHARLES HUFFNAGLE.

WILLIS EARLE.

JOSEPH WILLIS.

I find embodied in a Resolution of the Society, published in Part 1, Vol. vi., page xxiv., “that the object of restricting the gold medal and prize of 500 Rs., to an improvement on the Indian Churka, is to *ensure* a machine which should not only effect its work *quickly* and efficaciously, but be of a sufficiently moderate cost to admit of its being employed alike by the poorer as by the richer classes interested in cotton-cleaning.” In proportion to the number of hands employed to work it, the improved machine under consideration appears to work rather more *slowly* than the native *churka*, and with reference to cost the comparison is more than twenty to one in favor of the Native instrument, i. e. more than twenty times the capital has to be invested in the new apparatus, to give an equal out-turn in the same time with native *churkas*. One of the greatest objections to the native machine is the extreme slowness of its action, as when properly constructed it separates the seed from the wool very fairly. It does not appear to me that the new machine fulfils the requisition of speed.

The present annual export of cotton from Calcutta is stated to be about 1,200,000 maunds. Supposing the whole of this to be cleaned by the new machines, and they worked continuously every day, 12 hours per day, each machine yielding daily 24 lbs. of wool, 45,555 of them would be required to clean the above-mentioned quantity in three months, which at sixty Rupees each, would cost 27,33,300 Company's Rupees. The particular kind of *kupas* however experimented on by us, yields as much as 40 per cent. of cotton-wool, whilst most of the Indian cottons yield a much smaller proportion than this, some as little as 23 per cent., with which no doubt the daily out-turn would be considerably less, whilst with such machines, involving complexity and the necessity of mechanical accuracy and adjustments, a certain number would always be under repair and “*hors de combat*.” Thus the actual number required to be established would be far

greater than above stated. The exports in this staple from Bombay and other ports I believe far exceed those of Calcutta, so^t that it would appear, that it would require enormous capital to be invested in these machines to take the place of the ordinary method—the combined effect of its comparatively high cost and slow action. Had the machine approached the saw-gin in the amount of its results, the cost would have been moderate, but as it is, such does not appear to be the case.

It has occurred to me to offer these observations as it appears so desirable, that the Society should be put in possession of all the data available, in order to come to a correct conclusion on a subject affecting so important and national a staple as the one in question.

HY. MORNAY,

Member of the Committee.

The 10th and 11th paras. of the report, render the above remarks in my opinion, null. The 10th shows the Society's proceedings regarding the prizes to be awarded, and the 11th states, "your Committee at the same time would guard the Society from the supposition that this machine, however great the improvement, is likely in the present state of civilization, and agricultural progress in India, to become an available machine to the cotton growing population." Now, what is the improvement here spoken of? Why it would turn out cotton, worth one rupee per maund, more in the market than what is now sold as the produce of the Surat country, and cleaned of course by the *churka*? See para. 8, of the report. It appears to me that the superiority is established.

November 15th, 1848.

WM. SAGE.

APPENDIX No. 1.

*Report upon five samples of Cotton passed through certain Churkas
on the 23rd September, 1848.*

No. 1.—Moderately clean, and *almost freed from seed*, as well as the seed from the cotton.

No. 2.—This sample is not sufficiently clean, and by having so much seed in it in a crushed state, will be objectionable. The seed also, from this batch of cotton, does not appear to be stripped or freed from portions of cotton which still adhere to it, and the cotton is not sufficiently opened out, but clotted together.

No. 3.—Is very full of black moats, exceedingly dirty, and the seed from this parcel is not sufficiently stripped of the cotton. This is a worse sample than No. 2, and would, for general purposes, have to be re-picked before it could be used.

No. 4.—I regard this as a very clean parcel, and might be used with a mixture of American for the manufacturing of cloths which have the greatest bulk of consumption. The seed also seems well freed, and it would bring a much higher price than No. 3 in the Liverpool market.

No. 5.—This is also a good sample, and could, with No. 4, be generally used in mixing with American. It is, in my opinion, cleaner than most American we receive in Liverpool. The seed is well freed also. There would be very little difference in value between these two, Nos. 4 and 5.

I consider, that were the Surat cottons which enter the Liverpool market, cleaned equally as well as samples No. 4 and 5, they would bring $\frac{1}{4}d.$ to $\frac{3}{8}d.$ per lb. more than they now do. It would, moreover, be a great advantage, as well as a saving to spinners, to receive them in so clean a state.

(Signed) EDWARD SMITH.

CALCUTTA:

25th September, 1848.

APPENDIX No. 2.

Calcutta : 27th September, 1848.

DEAR SIR,—I have the pleasure to acknowledge the receipt of your letter of 20th instant, and underneath I beg to hand you replies to the questions contained therein.

1st. As to the cleanliness of the samples. The following is the order in which I should place the several packages you have sent me, Nos. 4 and 5—1, 2, 3 ; one of the advantages which the packages Nos. 4 and 5 have over the other lots is the total absence of crushed or broken seeds.

2nd. As to the state in which they have been opened out and their fitness for the carding and spinning machines. In this case also, I should place the samples as I have done above. The benefit arising from the cotton being opened in passing through the *churka*, specially cotton of very short staple such as this, would not, I think, be of much importance, were it not that by this means the cotton would be more thoroughly cleaned of leaf than it can be, (without considerable injury to the staple) after it has once been pressed in the bale ; it is unfortunate therefore that the *kupas* tried at the late meeting of the Society was so clear of leaf, as not to show how far the brushes were adapted for this purpose. With respect to the carding and spinning, it must be always a great advantage to have the cotton clean not only from the injury which the broken seeds and leaf do to the card-sheeting, but also from the irregularities that they cause in the thread. I have more difficulty in answering your 3rd question relative to the comparative value of your samples and the cotton used at the Glo'ster mills, inasmuch as it appears to me they are not at all adapted for the same market,—thus in Liverpool, there is no doubt that the Surat or Omrawuttee cotton, which is the cotton used at the Glo'ster mills, would bring a higher price than yours, whereas the result would probably be very different if both samples were sent to China. I have no hesitation however in saying, that could the Glo'ster Mills Company procure Surat cotton equal in cleanliness to your samples No. 4 and 5, its value would be enhanced more than a Rupee a maund, or say on

an average 10 per cent. The cotton which the Glo'ster Company principally use is Surat or Omrawuttee cotton, and is chiefly grown, I believe, at Surat and in the Nizam's territories; it is imported from Bombay for the mill; for though a large quantity comes Overland via Mirzapore, yet it has been found not only higher in price, but considerably more dirty and of worse quality than that procured from Bombay.

I am, dear Sir,

Your's faithfully,

(Signed) H. MARSHALL.

The Secretary Agri-Horticultural Society,

Metcalfs Hall.

*Memorandum descriptive of the New Cotton-cleaning Machines,
constructed for Government by J. H. MATHER, Civil Engineer.*

The new cotton-cleaning machine, for which the Agricultural and Horticultural Society of India awarded their gold medal and the premium of five hundred rupees, placed at their disposal by Major Jenkins, and of which four views are given in Plate I, was one out of a set of twelve which were constructed for the Government of the north-western provinces, and have lately been despatched to Agra, where it is intended to erect them in a building, of which a plan and section are given in Plate II. The motive power will be supplied to the machines when thus erected from a cattle-mill worked by a pair of bullocks, which will be connected by means of a band or strap with the pulley (marked *g* in Plate II,) keyed on to the end of the main shaft *a*; the machines will be placed in the upper room of the cleaning-house and will be driven by the straps marked *H*, off the pulleys *d*, which are also keyed on to the main shaft, and are of three feet diameter each. The *kupas*, when first brought to the cleaning-house, will be placed in the long bin *J*, in the upper room, whence it will be supplied as required, to the boxes *K*, of the several machines. The operation of feeding the machine is shown in Fig. IV. Plate I, as well as in the sectional view of the cleaning-house in Plate II, the cleaned cotton is discharged from the machine through a spout *b*, which forms part of the machine, and passes through the wall of the build-

ing into the two enclosed verandah-rooms L : these latter rooms will be closed while the machines are at work, and will only be opened at the end of the day's work for the removal of the cotton. This arrangement alone will be found to protect the cotton very considerably from the impurities which at present find their way into it after it has been cleaned by the native *churka*. The seed when separated from the cotton will fall down the spout F, (Fig. III. Plate I,) into the space partitioned off to receive it on the ground-floor marked *m*, Plate II.

Fig. III. Plate I, exhibits a sectional view of the machine. A and B are the two rollers between which the cotton is passed, and at the point of contact between which it is divested of its seed. The lower roller A, is made of hard wood, of one-half inch diameter ; a wrought iron spindle or shaft, three-quarters inch in diameter, is inserted through this roller from end to end, on to which is keyed the spur-wheel M, which is driven from the driving shaft of the machine by the pinion N. The upper roller B, is of steel, half inch in diameter, and its surface is slightly indented with chisel-cuts in a diagonal direction, in order to give it some hold on the cotton ; on to one end of the steel roller the pulley P, Fig. II. is keyed, which is driven by a strap from pulley S, Fig. IV. on the driving shaft of the machine ; the two rollers are driven at the same surface velocity, viz. the wooden roller (one and a half inch in diameter) makes *one* revolution, while the steel roller (half inch in diameter) makes *three*.

The brushes C, Fig. III. attached to the four cast-iron arms on the driving shafts revolve rapidly, and sweep the wooden roller at three-quarters of an inch below the point of contact of the two rollers, such being found to be the average length of the fibre of the cotton for which these machines were intended. The length of the brushes can however be varied by means of their adjusting screws to suit any description of cotton.

Below the brushes is a concave-shaped iron wire grating D, through which dirt, dust, and particles of leaf adhering to the *kupas* are discharged by the action of the brushes. The cleaned cotton is then thrown by the brushes through the spout marked E, Figs. III. & IV. in Plate I, and *b*, in plate II, into the verandah-rooms L. The winch-handle and fly-wheel, Fig. IV. Plate I, represent the manner in which

the machine was worked when exhibited to the Society in the Metcalfe Hall; this manner of working the machine was adopted on that occasion simply on account of there being no cattle-mill available for the purpose. The Special Committee of the Society notice in their report, that two men were employed to work this machine in addition to the man who fed it, and this has given rise to the erroneous impression that three men are *required* for each machine; whereas with suitable driving apparatus *one man* could drive at least 3 machines. The fly-wheel, &c. used in the Metcalfe Hall was an old one belonging to the Agricultural and Horticultural Society, and was quite unsuited for the purpose. Owing to these circumstances the only point on which a correct opinion could be formed by those who were present at the exhibition was, on the *quality of the cotton* turned out by this machine in comparison to that turned out by the native *churka*, and the other two competing machines. On this point the most satisfactory evidence was afforded to the Committee (see their report para. 8) as to the superiority of the cotton turned out by *this* machine. The Committee moreover in the 9th para. of their report state, with regard to the motive power applied at the time of exhibition, "your Committee consider that no satisfactory result as to the actual working of *Mather's* machine can be arrived at until tried upon the large scale intended by Government."

There are a few alterations which it will be desirable to introduce into any machines hereafter to be made, among which the giving additional speed to the brush-arms may be mentioned.

The Government have sanctioned the construction of eight sets of these machines for distribution in the Presidencies of Bombay and Madras, and have directed the work to be carried on at the Government iron bridge yard.

(Signed) J. H. MATHER, *Civil Engineer,*
Suptdg. Govt. Cotton Experiments.

IRON BRIDGE YARD, ALLIPORE :

6th January, 1849.

*Further notice regarding the "Pooah" of Nipal and Sikim ;
 "Poe" of Gurhwall and Kumaoon ; Boehmeria frutescens,
 Don ; Urtica frutescens, Thunb.*

In September 1847, the Society received from Dr. Campbell, the Superintendent of Darjeeling, specimens of a new sort of fibre, called *Pooah*, obtained from a plant which "grows wild and abundantly in the valleys throughout the mountains of eastern Nipal and Sikim ; at the foot of the hills skirting the Tarai, to the elevation of 1,000 or 1,200 feet, and within the mountains up to 3,000 feet." In an interesting notice accompanying this specimen, (which will be found at page 135 of this volume,) Dr. Campbell describes the plant, its *habitat*, the method of preparing the fibre, and the uses to which it is applied. The very favorable report (also published) made on this fibre by Captain Thompson, a member of the Flax and Hemp Committee, to the effect that, when properly dressed, he considered it quite equal to the best European flax, and better fitted for converting into sail-cloth than any other substance he had seen in India, induced the Society to apply to Dr. Campbell for specimens of the plant, with the view of ascertaining its name, and if it was to be found in other parts of the Himalayan valleys, than those mentioned by him. These he has been kind enough to send, and for the following report on them, the Society is indebted to Dr. Falconer, Supt. H. C. Botanic Garden :—

"I have examined Dr. Campbell's specimen of the *Pooah* plant. It is the *Boehmeria frutescens* of Botanists, common at lower elevations in the Himalayas from Gurwahl to the Sikim hills (Ganges to Burrampooter). In the outer hills of Gurwahl and Kumaoon it is called *Poe*, and the tough fibre is used there for making nets. The wood of another species is turned into bowls. In Darjeeling *B. frutescens* goes by a similar name *Pooah*, and the fibre is used for similar purposes.

"It was first described from Japan by Thunberg, who distinguishes it from the textile species *Bæhmeria* (or *Urtica*) *nivea*, which occurs there in abundance.

"I return the specimen herewith. It is a *male* flowered branch, the female plant differs."

SPECIMEN FROM DR. CAMPBELL, DARJEELING.

Bæhmeria frutescens, Don. Prod. Flor. Nepal. Syn.—*Urtica frutescens*, Thunb. Flor. Japan. p. 70.

Char.—*Bæhmeria*. "With the leaves elliptic-oblong, acuminate, coarsely serrated, acute at the base, covered underneath with a white coat; the branchlets with soft hair: the common flower-stalks axillary and divaricately branched."

Hab.—Japan and Himalayas, from Gurwahl to Darjeeling.

In Darjeeling called "Pooh."

In Gurwahl and Kumaon "Poec," fibre very tough, and made into nets.

On the treatment of the Peach. Communicated by

DR. K. M. SCOTT.

[Dr. K. M. Scott, Civil Surgeon at Gowhatti, Assam, having stated in a communication to the Society, read at its general meeting in July 1848, that in the previous May he had gathered from the peach trees in his garden 60 peaches, the four largest of which weighed together 83-12, the six next largest 104-8, and very few under 12 and 14 tolahs, with a circumference of from 9 to 10½ inches, was requested to furnish a few particulars as to his plan of treating his trees. These he has been so obliging as to submit to the Society, and they are now published for the information of those who take an interest in the raising of this fine fruit.]

I promised to let you know how my peach trees are treated, it is thus. In October I have a pit dug about 6 or 8 feet square and 4 deep, into it is first put a layer of sheep and cow-dung mixed with charcoal, about 12 inches in depth, over this a layer of small fish, (say about 10 seers,) upon which is sprinkled about a seer of lime. On the lime again, another layer of sheep and cow-dung, with charcoal and wood-ashes, going on as before till the pit is filled, when it

is covered over with a layer of soil. Last year I added some *khullee* (mustard oil cake), and I think with much benefit. Old skins and bones chopped up, mixed with sheep and cow-dung, and a little lime, and buried for 6 or 8 months, make a fine addition to the other. About the end of November, or when the flower-buds begin to appear, the trees are pruned, and the roots bored, to about $2\frac{1}{2}$ feet from the stem all round with a sharp-pointed bamboo, so as not to cut them. They are left exposed for about 3 weeks. After this the contents of the pit are mixed up with a little more charcoal, and spread among the roots, and the soil which was taken from them, strewed lightly over. As the peaches are formed they are thinned out, and when nearly ripe, bags are put on them to defend them from insects.

I have some cocoanut trees which I planted (from seed got from the bazar here) thriving famously, and now with beautiful heads of flowers: the two largest measure 7 feet 3 inches and 6 feet 2, respectively, in circumference: that is a good size—500 miles from the Sea!

Memoranda respecting the Government Teak plantation at Bancoorah; communicated by T. B. MACTIER, Esq., C.S.: with a few remarks thereon by Capt. THOMAS LATTER, late Supt. of the Teak Forests of the Tenasserim Provinces.

[Attracted by an application to the Society from Capt. F. C. Burnett, of the Artillery, for a supply of teak seed for trial in the Jullundur Doab, a large extent of which country appeared to him admirably adapted for the culture, Mr. Mactier, the Magistrate of Bancoorah, proffered his services in sending a supply from the Honorable Company's plantation in that district, where the trees seed very freely. In accepting this offer a request was made to Mr. Mactier for a few particulars regarding the plantation. These he has been kind enough to afford; and they are now published under the impression that they may be new to most of the readers of the Journal. The additional remarks furnished by Capt. Latter, are valuable, from the experience which the writer has acquired on the subject generally of Teak cultivation, as is shown by the long and interesting report which will be found in another part of this number.]

I am told that the teak plantation here [Bancoorah] was commenced by Mr. William Blunt upwards of 40 years ago, the site chosen by him being the banks of the Dalkeith river; the soil, though sandy, is good, the gardens of some of the residents of the station being situated within the line of the plantation, and the ryots cultivating sugar-cane just outside of it. The trees bore seed about 5 years after having been planted. The plantation has not been systematically cut down; trees, when fallen or undermined, have been cut, in order to save the timber, which I may observe is of good quality. Though small, the trees planted on the banks of the river have succeeded tolerably well, but those planted on the vicinity where the country is high, with a very few exceptions, have entirely failed. The trees which now exist are all hand-sown, but I am given to understand that the seed which falls from the trees in the cold weather germinates very freely in the rains, none of it however comes to anything from want of care. Of the extent of the plantation I cannot give even an approximation, it is so much scattered, but I should say upwards of 2000 trees still remain, they were at one time very much more numerous, the encroachments of the river have however carried numbers of them away. I am at present trying to save those which remain by cutting down those on the brink of the bank, for when a tree falls the roots carry with them a large quantity of the earth, and a large gap is left by which the river makes further encroachment. The general opinion here is, that the trees have failed for want of moisture; it may, however, be the soil, which partakes much more of a sandy than clayey nature. Of the size of the trees I cannot give you a correct estimate, but I am told, that one which was considered a large one, measured 12 feet from the ground to the fork, its diameter just above the ground being 18 inches, and just below the fork 12 inches (rough measurement), which I calculate would give a log of about 15 cubic feet.

I may mention, that I am indebted to the kindness of Dr. Check, who some years ago had charge of the plantations, for most of these particulars.

I regret I am unable to furnish you with a more particular description of the soil in which these trees grow ; when I say, however, that to an inexperienced eye it is that which prevails along the high banks of the Dalkeshur and Damoodah, you may perhaps be able to find some one better informed.

Note by Capt. Latter.—I was not aware till I perused Mr. Mactier's letter that there had been any teak planted in Bancoorah. The first thing that strikes me is the statement that the soil of the teak plantation is sandy, this would account for the very small size of the trees, as teak thrives best in a stiff clay. It requires plenty of moisture ; but a moisture that does not settle and stagnate ; this will be evident when we take into consideration the localities in which teak is most notorious, for instance, the Malabar hills, where large quantities of rain fall annually. The forests of the Tenasscrim, where the average annual fall of rain is 180 inches and upwards. The Yooma hills between Arracan and Burmah, where the average has been known to range as high as 240 inches annually. But in all these localities the drainage is rapid. There are some localities in the central portions of the Thoungyeen forests, called the Mieplai district, where teak is found in somewhat low and damp spots. But in such cases the wood is spongy and of an inferior quality ; the trees are almost invariably blown down before they become of any size, although the plant for the first few years appears to vegetate very luxuriantly.

The whole of the Arracan or Yooma hills, as far as they have been penetrated by Europeans, consist of immense deposits of clay, but where teak first presents itself, viz. on the banks of a mountain stream called the Hoosalong, the

underlying limestone begins to present itself. It is in such localities that teak is always found, if not of the largest size, at all events of the best quality. The next best locality is the steep clayey banks of rivers. Most of the forests in the Tenasserim Provinces are so situated. It is generally known that Maulmein or Tenasserim teak is much inferior in strength and compactness to Malabar teak. But this I think will appear to have arisen simply from the fact, that the Malabar specimens were from hill teak, whereas the Maulmein teak is still confined to more easy localities on the banks of streams.

I perceive in Mr. Mactier's letter that it is stated, that he understands that the seeds which fall from the trees of the teak plantation at Bancoorah, vegetate freely of themselves during the rains, but that they never come to anything. I did not visit the Maulmein forests during the rains, but I made a very extensive inspection of them immediately after the rains, and before the commencement of the periodical fires; and I always found that where there was a young and vigorous company of teak trees there were no self-sown seedlings. But where there were a few old trees scattered about they were accompanied with swarms of seedlings. From this I inferred in my official report, that the seed of vigorously growing teak trees did not germinate, by this I meant when left to themselves. I sent a large quantity of the seeds of such trees to the Superintendent of the Botanical Gardens and to the Agricultural Society,* of which, with common care, a very fair average have come up, whereas if they had been left to run their chance in the forests, not one perhaps would have come up.

The subject of the artificial propagation of teak is too important a one to be entered upon in a short note. but I

* A moiety of the stock furnished to the Agricultural Society has been despatched to Capt. Burnett.—Eds.

do not think it will ever succeed unless undertaken on an extensive scale, and under the careful personal superintendence of an European, practically and locally acquainted with the teak tree and its favorite localities. If left to native subordinates no reliance can be placed upon the attempt being fairly and thoroughly carried out. The first planting might be in nurseries, each seed sown 18 inches apart, but *above all, the ground should be strewed thickly with straw*, for the purpose of retaining the moisture, and preserving the dampness natural to forest soils. Each plant might then be transplanted during the early part of the rains. But the subject is one which will not for some time attract public attention, as it should; not indeed till our Maulmein teak becomes scarce, which will not be many years more.

Report of further tanning experiments with pods of the "Teree" of Chittagong, an undescribed species of Casalpinia, by Mr. JOHN TEIL.

I was duly favored with your communication of the 18th May, together with the extract of a letter dated March of the present year, from Mr. Sconce of Chittagong, with the *Teree* pods therein noticed, and which I have, after a series of experiments, to report upon as follows, viz. :—

1st. Pursuing my proposition in letter No. 272, of the 2nd June 1847,* I, on receipt of the pods in question, commenced the preparation of two thick buffaloe hides, for the purpose of tanning them, exclusively with the *Teree* pods, into which they were put in the usual form on the 10th of April last. The process continued apparently all right for about 5 or 6 days, but the tan did not appear to enter or affect the hides as I could have wished after that time, (although I had several times, as is usual, changed the stale liquor for fresh, with addition of new pods,) it gradually changed

* This letter will be found in Part I. of the present Volume, p. 6—Appendix.—EDS.

from the bright to a dark unnatural color, while I observed the hides to swell to an immense thickness, becoming as loose and as spongy in proportion until the end of the month (April). I concluded it would be useless to spend any more time, labor, or materials upon the hides in question, as I saw they would be of no use whatever for any purpose; but that I would make another attempt at similar hides, watching its process more minutely, as I imagined that some accident or another might have caused so extraordinary an occurrence.

I made therefore a second experiment on one buffalo hide during the months of May and June, and although I exercised every precaution, I still had the same result, which led me again to try them on a thin cow hide and calf skins, the latter of which resulted so satisfactorily with the pods last year.

The pieces of leather accompanying herewith, marked respectively *A* and *B*, are the results of such subsequent trials, but which have not, I much regret to state, given the satisfaction I had anticipated, consequent upon the trials on a small scale I made last year.

The piece of leather marked *A*, is part of a country cow hide, tanned exclusively with the *Teree* pods, occupying as nearly as possible, a third of time longer than when tanned with *Babool* bark, or about 5 weeks, while the quantity of pods necessary to preserve it was immense, being about one maund for 5½ lbs. of leather, while the quality of leather is not such as would be readily saleable, owing to its not possessing that lively and bright appearance, a color necessary for that purpose.

The other piece marked *B*, is a whole calf skin, something similar to that I submitted to the Society last year: this skin, with 11 others (in all 12), were treated with the pods in every way similar to that in 1847, but while that skin was tanned in four days with only 3 lbs. of pods, these 12 skins (which ought to have been tanned in the same length of time) occupied as nearly as possible twenty-two days, re-

quiring something more than two maunds of pods (without seeds) for their preservation, and even after so long a period I found several skins amongst the 12, very imperfectly tanned, while the color of them does not at all, in the present instance, encourage the use of the pod as a tanning material.

Upon a comparison of my present trials, with that upon the same article in 1847, and of their respective results, I am led to think, that the pods may have been subjected to injury, to which all tanning substances are so susceptible in various ways, such as,—

1st. Being gathered from the trees before they were thoroughly ripened.

2nd. Allowing them to remain too long on the tree, by which they are exposed, perhaps to rain and damp weather after they are ripe, and which would extract a great portion of their tanning matter.

3rd. The same effect would result from the pods being packed up the least damp, or from their having been kept in any place for any length of time, that was not perfectly dry.

But whether the pods here alluded to, have received injury from any one or a combination of the causes above noticed, I could speak with no certainty whatever, but am of opinion, that my second remark (from the appearance of the pods) is the most probable.

I send herewith for your inspection, two small parcels of the pods. That numbered 1, contains what appear to be *good pods*, while parcel No. 2, contains pods that I consider good for nothing, being to all appearance decayed, black, and possessing but very little if any tanning property, while the other pods in packet No. 1, appear to be quite fresh, of a light color, and full of astringency, and to the best of my recollection, are similar to the few you were good enough to send me last year.

This vast difference however in the quality of these pods, never once occurred to me till a few days ago, and I shall

consequently make further trials, both on thick hides and thin skins, selecting for their tannage, only such pods as I consider good, and hope hereafter to have the pleasure of communicating a more encouraging account of them to the Society, than I at present am able to do.

I feel much encouraged to prosecute further enquiries, as to their properties as a tanning substance, from the fact, that the pods as they now are, form, in combination with oxide of iron, an excellent and fast black dye (and which would not be possible were they minus of astringent properties); as regards its quality for leather, I can speak of it in very high terms, it however required a considerable quantity to make a good dye, which I conclude was the result of more than half of the pods used being inferior, but of which I was not aware at the time. I have much pleasure in sending you a bottle of the dye in question, but since by recent discovery of the inferiority of some of the pods, I shall not fail to make a further trial, and forward to the Society, a sample of leather blacked with the same, and particularly of the process, when its quality and probable value could be better ascertained. In the meantime, however, I would suggest, a sample of the good pods being forwarded for trial by some practical dyer in England, who would be better able to test its value as a dye-stuff in the English markets, in comparison to those now in use.*

Kidderpore : 4th October, 1848.

* This suggestion has been anticipated. Mr. T. M. Robinson, a member of the Society, has received a quantity of the pods from the stock sent by Mr. Sconce, one maund of which he has transmitted to Messrs. Learmouth and Roberts, of London, (Mr. Roberts is one of the most successful tanners and dyers in England.) Another maund Mr. Robinson has sent to Messrs. Lewis and Peat, of Mincing Lane, London, who will put it into the hands of some skilful dyer. Mr. R. has promised to transfer both reports to the Society.—EDS.

1. I am now happy to be able to give a favorable report upon the tanning properties of the *Teree* pod, so far as regards its application to skins only, from trials made with those received from you in the month of November, which have proved superior in every respect to the parcel received with your letter of the 18th May 1848, the results of which were given in my letter, No. 514, of the 4th of October.

2. Following the promises therein made, an experiment is now in process upon a stout buffaloe hide, which having been some months in manufacture, is not yet quite completed. I have however every hope, that in the course of three weeks or a month hence, to give a full report upon the same.

3. In the meantime I have the satisfaction to forward to you, three skins, tanned exclusively with the last parcel of *Teree* pods, received from you, which for distinction sake, I have marked respectively *A*, *B*, and *C*.

4. The skin marked *A*, which is in my opinion far superior to the other brown one, both as regards quality and appearance (its color being very bright), was tanned in the short space of 42 hours, in a strong decoction of *Teree* pods, having consumed during the process, as nearly as possible, 8 lbs. including seeds, or half that weight seeds excepted.

5. The other brown skin marked *B*, which from its darker color, is inferior to that marked *A*, was subjected to a very slow process of tanning, occupying as nearly as possible 16 days, and plainly exhibiting, that the longer the pod in solution be exposed to the air, the darker it becomes, and the less valuable is its production of leather: from this cause, and the consequent necessity of frequently changing its liquor with fresh solutions, the consumption of pod by the slow process, is fully double of what is required upon the quick method.

6. The other skin marked *C*, was tanned with that marked *B*, and consequently underwent a similar process, but has

been subsequently dyed black, with a dye made by a solution of the pods with oxide of iron. The dye (a bottle of which is herewith sent) appears to me extremely good, of which the color of the skin will bear ample proof, and leave little doubt, that the article, if cultivated at a reasonable cost, could be extensively made use of as dye-stuff, but as to its value as such an article, it would be difficult for other than a practical dyer to determine.

7. I very much doubt, whether the *Teree* pod will ultimately prove suitable for tanning heavy and stout leather, and draw my supposition from the one now in manufacture, as exhibiting the same detriment, as noticed in the 5th paragraph of this letter.

8. As to its capability of being most extensively used, in the manufacture of light skins and fancy leather, I think the skin marked *A*, will readily testify, from its beautiful light color, combined with such softness and pliability, as would enable the manufacturer to use them for the most delicate colors, to obtain skins of which description, the gall-nutt is so extensively used.

The *Teree* pod does not, in my opinion, possess so much strength as a tanning substance as the gall-nutt, but is as nearly as possible equal to the oak bark. It however nearly, if not quite, equals the former as regards color, when treated as upon the skin marked *A*, and imparts, in my opinion, as beautiful a hue to its dye. I have therefore not the slightest doubt, that if the pod could be exported at a reasonable expenditure, and it should prove, that the substance would keep good and free from injury during so long a voyage, it would ultimately prove a valuable addition to the present known tanning substances.

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Correspondence and Selections.

NOTICES REGARDING THE HIGHEST ELEVATION AT WHICH THE PLANTAIN IS FOUND.

*(Extract of a Letter from LIEUT. W. H. PARISH, dated Loodiana,
May 23rd, 1847.)*

WILL you kindly inform me at what elevations the plantain has been known to be cultivated? I am induced to ask this question, because I met with two or three plants growing in an enclosure at an elevation of 5,400 feet on the Chumba range. It was in January last that I made a trip to those hills: they run nearly due north and south, and attain the great height of about 16,000 feet above the sea. After crossing the sloping plain of Dhurmsala, I came upon a hamlet containing a few cottages and orchards, and in one of these latter, were growing the plants above-mentioned. They appeared to me to be in a healthy condition, and somewhat more than a year old. The cold of the winter season is severe. At that period snow to the depth of two inches covers the soil for several days together, and smart frosts frequently occur. I was informed that the heat, nevertheless, was great during the hot season. On the 1st of February last, the whole valley of Kangra, 2,000 feet lower than the plain of Dhurmsala, the latter, I was told, being 4,700 feet above the sea, was visited by a severe snow storm, which lasted two hours and twenty minutes; however, the natives told me this was an unusual occurrence, snow falling there only about once in five years. We had likewise several severe frosts: the thermometer falling 4° below the freezing point of Fahrenheit during the nights, and not rising above 32° until an hour after sunrise.

This severe weather happened after my return, and another opportunity was not afforded me of again visiting the Chumba range, which I was most anxious to have done for the purpose of ascertaining if the plantains had suffered from the cold or not.

It seems a great pity, that the noble plain of Dhurmsala, should be allowed to lay waste. I fear the climate would be too cold for

either the tea or the coffee, but some other crops might be found that would repay the cost of cultivation. I cannot help thinking that in the Kohistan of the Trans-Sutledge territory, very favorable localities would be met with for the cultivation of both the coffee and the tea plants. There, table and terraced lands abound from 1,200 to 2,500 feet above the sea, supplied with numerous springs and rivulets, which render the labour and cost of irrigation moderate.

On our return from Kangra in June last (1846), rambling about the hills, I met with a tall straggling and almost leafless bush, growing in the jungles on the hill sides, which I took to be a species of wild coffee. I did not succeed in obtaining any in blossom, but having gathered a few of the berries I chewed them, and found they tasted like the common coffee sold in the Loodiana bazar.

On our second march to Kangra, this last cold season, we went by a different route, viz. via Chennee and Rajpoor Ghauts and Joala Mcookee, returning by our former one, viz. Tuttipani, Dhamata, Nagrota, and Rae-ke-puttun; along the whole of which routes abundance of this same bush was met with. If no trees overshadowed it, the plant stood from 4 to 5 feet in height, and was tolerably leafy; but we found it thriving in moist and shady localities.

[Capt. Munro, to whom the above letter was shewn, mentions that he "has frequently met with the plantain thriving very well at considerable elevations, particularly in Kernaon, and certainly in four or five instances between four and five hundred feet above the sea." In the Khondah slopes of the Neilgherries, Capt. Munro has seen the wild plantain at 7,000 feet above the sea.]

DEAR SIR,—I observe in the last report of the Society's proceedings, a notice of communications from Lieut. Parish and Capt. Munro, regarding the elevation at which the plantain is found near Kote Kangra, and in the high elevations of Southern India. If the Society purposes to ascertain the zone of the plantain in the Himalaya generally, you may be pleased to learn where and how it is found in the Sikim mountains.

The plantain flourishes in Sikim at all elevations up to 6,000 feet: close to Darjeeling it is found 500 feet higher and in an eastern exposure. It will grow even here (at Darjeeling) when planted;

but is not found native so high. The hill people cultivate it near their residence when they live at elevations not above 3,000 feet.

The fruit is of immense size, the largest I have ever seen, about nine inches long, and seven inches in circumference, quite free from seeds, soft and pulpy when ripe; not bitter but of poor flavor. It is a favorite with the Lepchas, although they do not often cultivate it in consequence, I believe, of their wandering habits, and the time it takes to grow, which is not suited to their desultory mode of cultivation.

At the highest elevations above noted, the fruit is found in the wild state only, and is, as in other places, full of seed, and very bitter. Nevertheless it is eaten; fried in oil or butter when the latter are procurable, when not, it is roasted, or eaten raw, ripe, or unripe, as it happens.

Darjeeling : June 25th, 1847.

A. CAMPBELL.

THE PROPAGATION OF PLANTS FROM LEAVES. COMMUNICATED
BY R. DODD, ESQ.

A day or two ago you showed me a letter* from Dr. Cheek, regarding the propagation of plants from leaves, but as that gentleman appears only to mention the *Hoya* and Orange plant as those which he has tried, perhaps a few more hints may be acceptable to you.

About eighteen months ago I was induced, after having read many notices in the *Gardener's Chronicle*, to attempt the propagation of various plants from leaves; those which I principally tried were *Eranthemum pulchellum*, *Ixora*, *bandhuca* and *rosea*, orange, lime, and lemons, *Hammelia patens*, *Hoya carnosa*, *Duranta plumerii*, and *Jatropha panduræfolia*: with all these I succeeded very well, so much so, that I seldom lost one plant: under one glass I had in all 25 leaves from thirteen different plants, of which not one was lost, but nearly all required much excitement to induce them to produce shoots upwards. I had frequently to stir them about after they were rooted; transplanting them even before I could make them start; and even when they had grown to the height of about six inches, I found the

* This communication will be found in Vol. v., page 191, Correspondence department.

Ixoras and *Eranthemum* required the head to be nipped off before they would advance further.

The *upper* side of the leaf must be exposed to the light, and *to this I would draw particular attention*. As in the instance I have mentioned, when I had 25 leaves under one glass, and lost none, I had at the same time 15 under another glass of the same plants, with their *under* sides turned to the light, and lost all but three, which three never came to perfection.

I must also mention, that plants having their leaves opposite (and it may be in others, but I have not tried them), if the shoot is split in half, giving to each leaf a portion of wood, and then planted and treated as cuttings, both the roots and shoots grow readily enough, and more so than the propagation by leaf alone : in this manner many a valuable plant may be easily propagated, and at the same time readily increased. I tried the leaf of the *Poinsettia*, but I am doubtful whether it grew or not.

Should any others be induced to try the experiment, I shall be happy to let you know more fully the results of all my trials ; suffice it to say, I would recommend the leaves to be planted in sand about one quarter their depth, and after they are rooted let them be transplanted into pots, having about one-third leaf-mould or light earth, and the remainder sand.

I am going to continue these experiments, and should I have any success worth making public, you shall hear again from me.

P. S.—I find in Liebig the following : “ Leaves, species of leaves, and even pedunculi or petioles took root, and in part budded in pure charcoal. Amongst others we may mention, the foliola of several of the *Cycadææ* as having taken root, as did also part of the leaves of the *Begonia Telfairia* and *Jacaranda Braziliensis* ; leaves of *Euphorbia fastuosa*, *Oxalis Barrelieri*, *Ficus*, *Cyclamen*, *Polyanthes*, *Mesembryanthemum* ; also the delicate leaves of the *Lophospermum* and *Martynia* ; pieces of a leaf of the *Agave Americana* ; tufts of *Pinus* : and all without the aid of a previously formed bud.”

Calcutta : 8th March, 1847.

NOTICES REGARDING SOME FOSSIL SPECIMENS FROM THE NEIGH-
BOURHOOD OF LULLUTPORE, NEAR SAUGOR, FORWARDED BY
ALFRED H. CHEEK, ESQ., SURGEON, SINDIA'S CONTINGENT.

I have the pleasure to enclose for the inspection of yourself and the Members of the Agricultural and Horticultural Society, some curious fossil specimens found at some quarries about 14 miles hence, deposited in sandstone. They have, as you may observe, the appearance of iron balls! I have no idea of their composition, but if shown to some Geologist, I dare say he would favor me and other Members with his opinion regarding them. They have been pronounced to be the excrement of crocodiles! by a gentleman who has studied geology, but whether such be the case or not, I leave gentlemen versed in such sciences to decide. Though I am aware collecting geological specimens is foreign to the Society, still I have sent these as a curiosity, and shall be happy to procure you or any of the Members a few more of the same, should they be deemed worthy of acceptance.

With these sandstone slabs we have built great part of our houses at this station, and these curious balls are to be seen in many of the door-steps, &c. and in fact nearly in every stone when split.

Lullutpoor, via Saugor : January 18th, 1847.

*Memorandum by Dr. McCLELLAND regarding the above-mentioned
Fossils.*

The fossils are, I think, without much if any doubt, to be regarded as the fruit of a kind of palm, something like *Saguerus* or *Caryota*. The genus may however be considered as extinct, and as generally the case with regard to fossil palms, to have had pinnate leaves.

Of the four specimens sent, one is detached from the matrix, and in a pretty good state for examination. It presents a slightly prominent apex, which is characteristic of the order alluded to. The fractured one exhibits the appearance of having been a one-celled fruit or nut, which is a further corroboration of the above inference, added to which, is the manner in which they are said to occur dispersed throughout the sandstone in certain localities, and probably they will be found to be limited to certain beds or strata.

This would forbid the supposition of their having belonged to any plant having few or solitary fruit, but is quite consistent with the character of palms, which bear many thousand fruits frequently on a single path. Such fruit moreover, from their sound compact form and hard fibrous character, as well as from their number, are more likely to be found preserved and imbedded in the strata than other parts of the plant. Nevertheless, I should think some portions of the fibrous roots or traces of the stems may be found, although as may be expected, such parts must necessarily be of comparatively rare occurrence, and perhaps from their size and shape might rather be expected to be found detached in ravines or in natural exposures of the surface than in quarries, which, unless very extensive, disclose comparatively small portions of the rocks to view.

Fossil palms chiefly belong to the tertiary period, and hence the very great interest of Mr. Cheek's discovery as a means of indicating the proper position of this sandstone in a geological series.

I beg herewith to give the following description of these fossils :—

Form.—Globose, from the size of a pea to half an inch or more in diameter.

Apex.—Slightly mamillate, and pointed, very slightly raised, and in some obscure, rounded, or abraded.

Base.—Round, without any very obvious pit or depression.

Colour.—Dark brown, exhibiting when fractured a white nucleus.

Matrix.—A hard, rather fine grained sandstone, with slaty fracture, and of reddish-grey color, with greyish, purple, and yellow streaks.

NOTICES REGARDING THE VALUABLE TANNING PROPERTIES
OF THE POD OF A TREE COMMON TO THE CHITTAGONG
DISTRICT.

*Extract of a letter from A. SCONCE, Esq., C. S., dated Chittagong,
23rd April, 1847.*

You may remember I promised, some two years ago, to send you what appeared to be the pods of a *Gæsalpinia* growing wild here. I now forward to you a basket full.

The pods have the astringent taste, like the Sumach. I know nothing myself of Botany, but it may be interesting to know how far

these pods approach those of the Sumach, in being of use for tanning purposes.

The seeds you will see are much larger than Sumach seeds.

[*Note.*—These seeds and a specimen leaf were referred to Capt. Munro, who, though unable to recognize the species from the absence of the flower, has no doubt it belongs either to the genus *Casalpinia* or *Acacia*.]

Report by Mr. JOHN TEIL, on the above-mentioned pods.

I was duly favored with your note of the 3rd instant, together with the basket of pods which accompanied it, which I immediately put to the test, and have now much pleasure in communicating a most favorable result.

The accompanying skin has been tanned exclusively with the pods received with your letter ; the quantity used was three lbs. exclusive of the seeds, and the skin was four days undergoing the process of tanning.

The leather, I conceive to be of a very superior quality, possessing not only an equality in softness with that tanned by "Dividivi," but surpassing it in color and appearance, and is consequently capable of being used far more extensively for tanning purposes, especially when a bright color is required, than the Dividivi.

The calf skin herewith submitted has undergone a *slow* process of tanning as being, in my opinion, the best and surest method of ascertaining the real properties of the substance used, as the generality of tanning solutions become, the more they are exposed in a liquid state to the action of the air, of a dark or discolored appearance, but which I am happy to state, is very slightly the case with the article now alluded to.

If therefore it can be extensively grown, not only at Chittagong, but also in other parts of the country at a moderate expense, I feel confident it would become an article of considerable demand in foreign markets, besides being extensively used in this country : its only objection being, that the *seeds* equal in weight the tanning portion of the pods.

I regret that I have been unable from the small quantity which accompanied your letter, to ascertain the exact strength of its tanning properties, compared with the Dividivi and other substances,

but if it were possible to obtain a larger supply, say ten or twelve maunds, from Chittagong, I should have much pleasure in trying it upon thick hides, and thereby ascertain its exact strength, and to what extent it could actually be made use of.

Extract of a Letter from Mr. SCONCE, dated 7th July, 1847.

I am much obliged to you for sending me Mr. Teil's report of his experiment with the seeds I sent you. It is certainly very satisfactory. But I very much regret that the season is so far advanced that I am unable to send you any more seeds, or I should say pods. At the time I procured the last supply, I might have sent any quantity. Our hills are covered with the plant—growing not alone, but in common with the ordinary jungle. It may be interesting to receive into your Nursery some of the plants,* and when I hear of a boat going I will send some; unless indeed you should have ascertained that the plant is common to your neighbourhood as well as ours. I will do all I can next year to send you an abundant supply of the pods. It is called *Jeree*.

COMMUNICATION ACCOMPANYING TWO SAMPLES OF ARRACAN
RICE, CLEANED BY MACHINERY IN THE UNITED STATES.

Extract of a Letter from Major BOGLE, Commissioner of Arracan, dated 27th March, 1847.

By the present opportunity I do myself the pleasure to send you for submission to the Society, two small samples of Arracan rice, shipped on board the American ship *Douglas*, at Akyab, in January 1846, and taken via China to Boston or New York, I forget which, I think the former, there cleaned by machinery, brought back in the *Douglas* to Arracan, and presented to me a few weeks ago.

No. 1, the finer kind, is *Lutooree*, No. 2 is *Nakrinsee*, our very coarsest grain: this latter, it will be observed, is much broken, which the Captain of the *Douglas* explained to me was owing to the machinery not having been adapted to so large a grain, but that with a little trouble it can be adapted to any size.

* Several hundred seedlings have already been raised in the Society's garden.—Eds.

Both kinds of rice were shipped as cargo rice, that is, only half cleaned, at about 24 Rupees per 100 baskets of twelve seers of 85 tolahs each, (such is the price at this present time), and I am informed by the exporter, that when cleaned it sold in America at a quarter to one-eighth of a cent. less per lb. than Carolina rice! Now I wish to fix attention particularly upon this fact, which I believe to be correctly stated, and also upon the condition and appearance of the rice as now transmitted by me after its having visited both China and America, and been more than thirteen months on its voyage; and I think it must now be admitted, that the grain of Arracan, when properly treated, is perfectly adapted for any market in the world. I am informed, that machinery similar to that by which the samples now sent you were cleaned, has lately been set up in London, Liverpool, and most of the largest cities of Great Britain, as also at Antwerp, Hamburg, Bourdeaux, Nantes, and other towns on the Continent of Europe, while in America it is even more common.

I lately had an opportunity of seeing a sample of *Nakrinsee* rice, which had been cleaned at Bourdeaux; it was even more perfect than that which I now send you, and was given to me by the commander of a French ship, which loaded about a month ago at Akyab with cargo rice, and sailed direct for Bourdeaux, a pretty strong proof of the exporter's faith in the steam mills at that place. I may also mention, that a large ship arrived at Akyab, about a week ago, for the purpose of conveying our cleaned rice and paddy to the steam mills at Antwerp, it is believed on account of the Belgium Government; so that there can be very little doubt, that they have now got a description of machinery at home which adapts the grain of Arracan as perfectly to the European market as the grain of every other place in India.

Large shipments are this season being made from Akyab to Europe, and a considerable trade has sprung up with Bourbon, not heretofore a large customer, and I cannot doubt, that when the place becomes better known, its commerce will vastly expand.

Be it our task to extend its fame by placing within view of all who may be interested in the rice trade, the samples herewith transmitted, and letting it be known, that uncleaned rice of the same description may ordinarily be procured at 24 to 25 Rupees per 100 baskets of twelve seers each.

COMMUNICATIONS RESPECTING A DISEASE AFFECTING THE
POTATO CROPS IN CERTAIN PARTS OF INDIA.

Memorandum from the Deputy Secretary, submitted at a General Meeting, held on the 8th June, 1847.

A member of the Society (Mr. Dodd,) having brought to my notice a month ago a few potatoes, very much spotted, which he had received from a resident of the Hooghly district, who had informed him, that a disease of some sort had infected the cultivation in that locality,—I addressed Mr. F. W. Russell, the President of the Hooghly Branch Society, on the subject. Mr. Russell was kind enough to make many enquiries of his friends in various parts of the district, and the result fully bears out the notice first received. “All the cultivators” observes Mr. Russell, “say, that this year, owing to the wet, the potatoes have black spots in them, and that they rapidly spoil. I purchased from a gardener four maunds of what appeared beautiful potatoes, but three and a half at least have rotted entirely, and in doing so, threw forth a peculiar bad smell, very unlike the common smell of spoiling potatoes. We can only with difficulty procure really sound potatoes.”

Mr. Russell has since sent me a few of these potatoes, half of which, with those received from Mr. Dodd, are now placed on the table. The other half I sent to Dr. O’Shaughnessy, who has obligingly given me his opinion in a note, copy of which I subjoin.

“I am much obliged by your kindness in permitting me to see the specimen of diseased potatoes from Hooghly. If I am not much mistaken, the same appearance has been noticed by many private families in Calcutta for the last three months. I can find no difference in the chemical composition of the potatoes now sent from that of the healthy root. Mr. J. W. Grant has obligingly examined them microscopically, but without obtaining any conclusive result. I have the pleasure to enclose Mr. Grant’s note.”

“On the whole, these specimens do not afford any strong evidence that the potatoe disease has, as yet, appeared in Bengal. But the spots are very suspicious, and are, I much fear, the precursors of the real malady.”

I have brought the subject thus prominently to the notice of the meeting, in the hope that members of the Society, resident in other parts of the country, will communicate the result of their enquiries; whereby we shall be able to learn whether this disease is confined to a particular locality, or has extended over other districts.

From R. Neave, Esq.; dated Azimghur, 23rd June, 1847.—In the cold weather of 1842-43, I first perceived black spots in the potatoes in my garden at this place, and I attribute it to the want of renewing the seed. On this account in 1843-44, I sent to Juanpoor for seed, as well as Patna, from the latter place I heard, that the same disease had there become prevalent, and I got no seed. That which I procured from Juanpoor turned out no better than my own. For two years I was absent from India; in my absence the gardener went on propagating from the old stock, and those dug up this year are spotted, but no worse than when I first observed the peculiarity. These specks do not appear in the small fruit but only in the large ones, when they get as big as a middling-sized apple. They do not materially injure the fruit; they affect the part immediately in contact with them: but the rest of the vegetable is perfectly edible.

From T. J. Atkinson, Esq., dated Burdwan, 26th June, 1847.—At your last meeting I observed, that the “potatoe disease” having reached this country, was brought to the notice of the Society, and you solicited other members to give what information they could on the subject.

At one or two of my factories on the banks of the Damooda, potatoes are grown in large quantities, and of a very superior quality, and I annually purchase for my friends from 100 to 150 maunds. •

This season I bought a large quantity, as they were very cheap, to feed my cattle. About two months ago the godown keeper reported, that they were rotting in large quantities, and that he had been feeding the cattle with the rotten ones, to which they seemed to have no objection, but ate greedily, and without doing them any harm.

This is astonishing, for the stench from them is horrible; and on examining them I found that the *real* potatoe disease had got amongst

them. I saw it in England, and do not think I can be mistaken. The few potatoes that remain, *look* quite good on the outside, but when cut, they are all spotted: it is with difficulty a sound potatoe can be got out of the lot that I procured from the banks of the Damooda. But I also bought a few at a factory bordering on the Hooghly district, adjoining the high road, these potatoes are *quite* sound. But they were grown on the factory land where the *seetee* is thrown, which is a deep bed of sand, and only made productive by the *seetee*.

The ryots are complaining of their seed getting all rotten also. It were good for them that the whole became so, so that they might procure sound seed from other districts.

To too much moisture they attribute the cause. But was it not that, that introduced the disease into England? I have written to all my friends who I supplied with potatoes, and they all complain; but mention, that we are not the only sufferers, for the whole station of Burdwan has suffered, though the potatoes were brought from all parts of the district.

From Major T. E. A. Napleton, Secretary Branch Agri-Horticultural Society, Bhaugleapore, dated 5th July, 1847.—Mr. Blechynden sometime ago wrote and asked me whether the potatoe disease had made its appearance in this part of the world. I am sorry I could not answer the question at the time, but have now the pleasure to send such information as I have gleaned from my *own observation*. It so happens that boat loads of potatoes are sent to this place for sale from Hadjeeapore and Patna in the months of March and April, and sometimes in May. This year I, on two occasions, proceeded in person to view the cargoes of some of these boats, and found at least 2 out of 3 potatoes when cut to be diseased: several black spots appearing, and on inspecting some potatoes after they were boiled, they proved totally unfit for use. The black spots in most instances extended like a core through the whole potatoe.

Then again there is Sultangunge, a large village, 16 miles due west of this place, which is famous for its potatoe cultivation, or rather has been until the present year.

The out-turn of last season's crop was to all appearance very fine as to size and cleanness, but proved to be one mass of disease within.

Thirdly, I may mention, that I have enquired from several persons residing near potatoe cultivation of late, and the result of that inquiry is, that the described disease has generally appeared.

You will be glad to hear that the potatoes grown in our public garden last season are quite free from disease. We have now about 25 maunds of acclimated Darjeeling potatoes (kept for seed) in sand, in beautiful order; having disposed of some 40 maunds of other sorts, which were also clean, and in a healthy condition.

I am of opinion, that a succession of crops from the same field, the same sort of manure being used each year, and last though not least, the same seed being planted, are sufficient causes for the appearance of the disease. You will perhaps think it strange, but it is quite true that the finest crop of potatoes raised in our public garden last season, was in ground which had, during the rains of 1846, received a heavy manuring of *seetee* (id est the indigo plant just after it was thrown out of the manufacturing vats). The *seetee* was ploughed in about a dozen times during the rains, until it rotted and became completely amalgamated with the soil. This certainly was an experiment, and I may add, that the finest field of cauliflowers ever perhaps seen in the whole of India were grown last season, also on a piece of ground similarly manured to the potatoe field.

Lastly, I would merely ask as a general question, whether disease, failure, or disappointment, one or the other, are not inevitable if the ground and the seed are impoverished or exhausted from a long succession of crops? Thus, for want of a change of seed, and the want of proper soil to receive them, may, in my humble opinion, be attributed the appearance of the potatoe disease in India.

Since writing the above, I have discovered that about two maunds of potatoes grown from Patna seed, in our public garden last season, are still left, and I have this moment cut a dozen through the centre, and every potatoe proved to be as clean and healthy as could be desired. On the other hand, it is well worthy of notice, that Alexander Grant, Esq., Civil Surgeon here, planted Patna potatoes in his garden last season, the ground being duly manured, and although the soil was to all appearance sandy and otherwise suited to potatoe cultivation, it has so happened, that the crop produced is full of disease.

REPORTS BY LONDON BROKERS ON TEA GROWN AND MANUFACTURED IN THE DEYRAH DHOON.

Communicated by the Government of the N. W. Provinces, to the Secretary to the Agricultural and Horticultural Society, Calcutta.

Rev. Dept. SIR,—I am directed by the Hon'ble the Lieutenant Governor to transmit to you for the information of the Agricultural and Horticultural Society, the annexed Extract (Paras. 2 to 8) from a dispatch from the Hon'ble Court of Directors, No. 11, dated 22nd September 1846, regarding the cultivation and manufacture of Tea in the North Western Provinces, together with the report therein mentioned.

I am, &c.

Lieut. Govr's. Camp :
The 18th January, 1847.

J. THORNTON,
Secretary to Government, N. W. P.

No. 1 IN No. 270 OF 1847.

Extract Paras. 2 to 8 from the Hon'ble Court's Dispatch, dated London, the 22nd September, 1846, No. 11.

Para. 2nd. We received by the "Minerva" a small box and two canisters of tea, the produce of the Government Tea Nursery at Kalaghair, in the Dehra Dhoon, alluded to in your letter of the 22nd November (No. 12) 1845.

3rd. These samples have been submitted to the inspection of qualified persons in this country, and by the reports of Messrs. Thompson and Sons, Mr. Hunt, and Messrs. Ewart, which we now transmit, you will perceive that the tea is pronounced to be equal to China tea of a superior class, possessing the flavor of the Orange Pekoe, but more than the usual strength of that tea, in other respects resembling that imported as Ning Yong. You will take measures for giving publicity to these reports.

4th. Comparing this tea with the samples formerly received, the reports on which were forwarded with our dispatch of the 28th February 1844, (No. 1.) the present specimens exhibit a marked improvement, the only defect pointed out being a "slight peculiarity of smell," or "deficiency of fragrance, probably arising from some defect in the firing."

5th. These specimens are very creditable to the efforts of the Superintendent Dr. Jameson, and his establishment.

6th. The latest report of Dr. Jameson shows, the quantity of land under tea cultivation in the districts of Kumaon and Gurhwal, including the Dhoon, to be 176 acres, and the total number of plants 3,22,579. The plant is stated to be thriving in different localities, extending over 4 degrees of latitude, and 3 of longitude, and that 100,000 acres are available in the Dhoon only, for purposes of tea cultivation.

7th. We observe that at a sale which took place at Almorah, 173 seers of this tea produced from 4 to 5 Rs. per seer, and Dr. Jameson is of opinion, that the produce of 6,000 acres of land would yield

<i>Estimate for 6,000 acres.</i>		
Establishment, ...	Rs.	87,000
Manufacturing and packing 6,000 mds. ...	...	6,234
Land and river carriage of ditto to Calcutta, ...	...	11,300
Contingencies, ...	...	7,200
Rent at 3 Rs. per acre, ...	...	18,000
		<hr/>
		1,29,734
Value of 6,000 mds. at Rs.		
1/8 per seer, ...	...	3,60,000

a surplus of Rs. 2,30,266 per annum, making in this calculation suitable allowance for a considerable reduction in the sale price, on the supply being increased to that extent, and sold in Calcutta; it is stated however, that the demand for the article in the Hill Provinces would be very extensive. The only obstacle to the general use of the Kumaon tea by the middling and better classes in those localities, being the high price at which it has hitherto sold.

8th. We feel a deep interest in this subject, and attach great importance to the success of a project from which considerable advantages would arise to the agricultural community of these districts, who would, it is stated, readily undertake the cultivation of the plant if encouraged to do so.

Report on the Tea manufactured in the Deyrah Dhoon, received per "Minerva," June, 1846.

Appearance of the Tea.—Well made, as well as China tea, and similar to the blackish, mixed curled Tetsong description.

Smell.—As China tea, but deficient in fragrance, arising probably from some defect in the firing.

Color of the infusion.—Bright and good.

Taste.—Rich, good, and strong.

Expanded Leaf.—As the finer tea from China.

Aroma.—As good China tea.

From this, and examinations of former samples, I am quite satisfied that the tea shrub in Kumaon, is not only identical with the China plant, and as capable of being made into as fine a description of tea, but also that the climate and soil in Kumaon is as suited to the favorable growth of the shrub as the finest of the China localities.

8th June, 1846.

(Sd.) WM. ANDREWS HUNT.

The leaf is well made, curled, of the Ankoï Pekoe class, mixed black and brown, and closely resembles that class of China tea.

The flavor is very strong, and would therefore be serviceable for mixing, but is “coarse burnt,” that all richness of flavor is destroyed.

38, Mincing Lane :

(Sd.)

WM. THOMPSON & SONS.

6th June, 1846.

The sample of tea marked as manufactured in the Deyrah Dhoon, August 1845, in leaf somewhat resembles the tea imported from China as Ning Young, with something of the character both of Oolong and Orange Pekoe. In flavor it most resembles the better descriptions of Orange Pekoe, having with the brisk burnt flavor of that description more than its usual strength.

There is, however, in this sample a slight peculiarity of smell and flavor which is rather objectionable, but it probably arises from some accidental cause to which this sample may have been exposed; either in curing or subsequently.

We consider it a good useful description of tea.

(Sd.)

EWART, MACCOUGHEY & DELAFOSSE,

Brokers.

Capthall Court : 17th June, 1846.

REPORTS OF SHOWS HELD BY THE BHAUGULPORE BRANCH AGRI-HORTI.
AND FLORICULTURAL SOCIETY, ON THE 26TH JANUARY, AND 25TH
MAY, 1847.

(Communicated by Major NAPLETON, Secretary to the Society.)

On Tuesday, the 26th of January 1847, the second exhibition for 1846-47 of flowers and vegetables took place in the Society's show-rooms at 4 o'clock P. M., the weather (owing to rain having fallen the day before) was delightful, and the attendance of subscribers and visitors excellent.

The following gentlemen were good enough to act as umpires in the vegetable departments, W. S. Alexander, Esq., C. B. Quintin, Esq., E. F. Lautour, Esq., W. T. Travers, Esq., and proceeded to inspect the produce of the public garden, which consisted of 3 sorts of new potatoes, (Cherra Poonjee, Darjeeling, and Patna) 3 sorts of peas, celery, Botan turnips, carrots, artichokes, lettuce, endive, Spanish radish, drumhead and red cabbage, French and Windsor beans, love apples, Tenasserim yams, nohl kohl, white and red Cabool capsicums, brinjals, onions, leeks, beet-root, mangul wurzul, borecole, and vegetable marrow. The Umpires pronounced the whole of these baskets of vegetables first rate, and not to be surpassed in India.

The potatoes, artichokes, celery, peas, beet-root, nohl kohl, were astonishingly fine. The weight of the following will, it is believed, prove satisfactory :

One stick of celery, 1 seer 12 chittacks.

One ditto of ditto, 1 seer 6 chittacks.

One ditto of ditto, 1 seer.

One ditto of ditto, 1 seer.

Drumhead Cabbage.

One weighed 6 seers.

One weighed 4 seers.

Red Cabbage.

One weighed $2\frac{1}{2}$ seers.

Beet-root.

Three pieces weighed 3 seers.

Acclimated Cabool Onions.

Three onions weighed 2 seers.

Acclimated Cherra Poonjee Potatoes.

Twelve potatoes weighed $2\frac{1}{2}$ seers.

One radish (Spanish) weighed 4 seers.

Two vegetable marrow weighed 4 seers.

A basket of artichokes, some of which measured fourteen inches in circumference each.

The dallee from private gardens were unusually fine, and the competition for prizes great.

[Prizes were awarded to twelve Mallees in the vegetable department.]

The floricultural department was very gay, and about twenty-five beautiful bouquets from the public garden were generally and deservedly admired.

Mr. R. F. Hodgson, Mrs. Watson, and Miss Russell, obligingly acted as Umpires in this department.

[Prizes were awarded to seven Mallees, for best specimens of flowers.]

List of New Subscribers since the last show, held on the 23rd of November.

T. Sherman, Esq., Baboo Shew Suhoy Sing, Baboo Chintanun Sing, Baboo Loll Jeet Sing, Baboo Mitreejeet Sing, Baboo Gungagobind Surbadeekaree, W. S. Alexander, Esq., C. S., W. B. Sherman, Esq., Roy Ram Mohun, C. Donzelle, Esq., G. Gough, Esq., C. S., The Rev. W. Beddy, H. Nelson, Esq., Major George Cox, 60th Regt. N. I., P. Levall, Esq., Raja Rajender Narrain Bahadoor.

May the 25th, 1847.

An exhibition of agricultural produce, vegetables, fruit, and flowers, took place in the Society's public garden this evening, and was attended by not less than one hundred members, besides many visitors and an immense concourse of spectators, and considering that up to 4 p. m. it was one of the hottest days ever experienced at the station, this will give some idea of the interest taken in an institution which has from its formation particularly aimed at the introduction into its own and the neighbouring districts, foreign cereal grains, flowers, fruit, and vegetables, to enable the cultivators to see the superiority of them to their own indigenous products. The cereal grains and other agricultural produce were first inspected. G. F. Brown, Esq., Dr. Grant, Moonshee Sultan Hoossain, and Moonshee Bukhoree Loll, were good enough to act as Umpires. There were several baskets of superior acclimated Nerbudda wheat, white linseed, Cuba tobacco, flax seed, oats, American maize, and a beautiful sample of acclimated Scotch barley, besides many baskets of indigenous wheat, barley, gram, safflower, pulse, dhall of sorts, red linseed, &c. &c. After a careful examination of the whole, a silver medal was awarded to E. F. Lautour, Esq. Civil Service, Gyah, for the best samples of acclimated Scotch barley and white linseed, and for the 2nd best samples of Nerbudda wheat, flax, and American maize, and several money prizes were adjudged. One to Mr. P. Onraet, for the best basket of Nerbudda wheat. One to Rajah Oodit Narain Sing, for the best tobacco and the finest red gram ever brought to the show. One to Mudden Tackoor for some splendid American maize.

The Society's Horticultural produce was next inspected, which consisted of grapes, peaches, plums, a large dallee of asparagus, Darjeeling and Cheera Poonjee potatoes, vegetable marrow, carrots, cucumbers, onions, leeks, mangul wurzul, love apples, West India arrow-root, herbs, and several baskets of indigenous vegetables. The Umpires pronounced the whole to be highly satisfactory and creditable. The produce of private gardens was now brought forward for competition. The sum of five rupees was awarded to the gardener of G. Drummond, Esq., Peergunge, Purneah, for a basket of very fine peaches, and on the fruit being tasted an extra sum of three rupees was adjudged, and considering this fruit had been conveyed a distance of about sixty miles the previous day, and should have proved No. 1 in the show, it is quite evident that Mr. Drummond must have bestowed great attention in the culture of this fine fruit. Mr. Drummond's gardener also received prizes for a basket of splendid acclimated Cabool onions and Darjeeling potatoes.

It is worthy of notice, that Mr. Drummond has brought the cultivation of the Darjeeling potatoe to great perfection in the Purneah district, both as to quality and quantity, and this is the first instance (which has been brought to our Branch Society's notice) of such a highly desirable result having been worked out on a soil hitherto considered very inferior for the cultivation of this grand staple esculent root.

[Here follows a list of prizes awarded to several other Mallees in the fruit, vegetable, and floricultural departments.]

List of new Subscribers since the 8th of February, 1847.

Baboo Muthooranauth Ghose, Maharajah Hetnarain Sing Bahadoor, Moulvee Uzeem Ooddeen Hoossein Ullee Khan, W. Travers, Esq., C. S., Moulvee Mochce Ooddeen Hoossein, Lollah Bukhoree Loll, Moulvee Moazum Hoossein Khan Bahadoor, W. M. Warwick, Esq., The Rev. J. W. Vaux, J. G. Campbell, Esq., Civil Service, Baboo Juggurnauth Suhoy, Baboo Rammoney Mohun Chowdry, Colonel Ouseley, Governor-General's Agent, Mahomed Hoossein, Moonsee Chunder Cashore, Lollah Simbhoo Dutt, Lollah Muhas Dutt, Baboo Gopeenauth, Baboo Kaulcepershaud, Munoo Loll Sookool, Ushud Ullee Khan, G. U. Yule, Esq., Civil Service, J. Payter, Esq., M. Mackenzie, Esq., D. Cunliffe, Esq., Civil Service, — Bonnett, Esq., G. Field, Esq., J. T. Good, Esq.

ON HYBRIDIZATION AMONGST VEGETABLES: BY THE HON. AND VERY REV.
WILLIAM HERBERT, LL.D., DEAN OF MANCHESTER.

Having been urged to prepare a paper for the Journal of the Horticultural Society, embodying whatever is known to me concerning the cross-breeding of vegetables—although I am not aware that I can add much to what I have

already laid before the public on this mysterious subject—in compliance with repeated requests, I will try to arrange what seems to me ascertained, and to point out some of the results, and some of the difficulties and uncertainties that require further investigation. When I first asserted that it was preposterous to suppose all the existing forms of vegetables, according to the subdivision of our botanical arrangement, to have been so specially created by the Almighty, and that I suspected the various forms of animal life to have also branched out from a smaller number of original types, I was attacked by some as a person who was minishing from, instead of attributing infinity to, the power and wisdom of God. I trust that the progress of useful knowledge has nearly dissipated such absurd calumnies; and that the labors of geologists have shown that, as the All-wise, who fills the unlimited expanse of universal space, speaks to us of his hands and handywork as if He were an artificer of our own definite dimensions, so the Scriptures detail the immense operations of ages before the creation of man by expressions conformable to our petty space of life—revealing in simple terms a few great truths, gradually and duly confirmed by the progress of scientific investigation, which brings to light the primordial remains that prove the succession of events, while it adds immeasurably to the greatness and majesty both of the operations themselves and of the means by which they have been effected, showing that they were not comprised within a diurnal week of our terrestrial life, but filled a gigantic page in the great volume of antecedent time. We must learn to understand the true force of the words of Scripture, and not derogate from the greatness of God by reducing it to the compass of our narrow conceptions. I have entered at length into that consideration in a late publication entitled ‘*The Christian*,’ and shall not now revert to the subject.

Let us, however, consider the grounds for believing that all the existing forms of vegetable and animal life flourished, such as they now are, from the first. If such was the case, why do the deposits of the old world not exhibit them all, as well and as plentifully as the lost races? And how comes it that the primæval forests, and the vegetation of primæval swamps, have vanished with the mastodon and the sauri, and neither the oak nor the chesnut, neither the rhododendron nor the azalea of our own days, are to be found amongst the remains of ancient time? We know of no second creation of vegetables; we have no account given to us, by any person having divine authority, of any successive acts of creation, except in the course and unfolding of the productive system by generation, and in the creation of land animals after the fowls and aquatic creatures, and of man after them, though every reproduction, where a new soul is incorporated with a new body, is in fact a fresh creation, but conformable to the law established by God at the commencement, when He said, “Let the waters and let the earth bring forth;” unless we adopt this, which perhaps is the most probable solution,

that the mandate to the earth to bring forth vegetables (that is to say, the law impressed upon its matter to that effect) had not merely instantaneous effect, but was a law continuing for ever to operate, and as long as the earth remained in the same general state, would reproduce the same results in the generations successively arising ; but, on each great change in the circumstances of the earth itself, would produce results, both in the vegetable and animal forms, that are continually arising from and returning to the dust, different from those which the same mandate or law of the Almighty evoked in its original condition. That simple view of the great creative act of Almighty God is calculated to give us the sublimest view of His unfathomable wisdom and power, and it accounts for the mystery of generative reproductions in similar form, as well as for the variations which have taken place in existing things since the first great periods of the creation. If the old saurian races, which are utterly extinct amongst animals, could only thrive in shallow salt water, which seems probable, we can understand why, after the uplifting of a larger portion of the earth and the confinement of the waters to deeper hollows within a narrower space, their races should have gradually failed, being drowned or starved in the deep, and unable to exist on the dry land. We may, perhaps, by a stretch of imagination, figure to ourselves some drier and more elevated spot in the earliest ages of the world, where the animals and vegetables which were destined to people it in later years, after the destruction of the races which prevailed at first, had their nidus, and were so closely quartered together, that the species of rhinoceros and roebuck now existing, by perpetually biting the oak or the hazel, prevented them from multiplying, and were in their turn so harassed by the hyænas of the existing species, that their races were barely able to perpetuate themselves ; while the extinct rhinoceros and hyæna have had a more rambling spirit, and gone forth into the wide world, and fed on the margin of the waters upon the vegetables and creatures of the shallow swamps, so that their bones became mingled with them in death. But, if anything so improbable were admitted, we should still be met by a grave difficulty ; for why should those which had overspread a wider space, and become multiplied, have disappeared from the world, and the species, which we must suppose to have been so limited in number and confined in space, that their remains have not been discovered, have since become prevalent in their stead ? I can suggest no rational solution for that difficulty ; no reason why the remains of the old world, when dragged from underground, should exhibit a rhinoceros and a hyæna, or a plant, of a kind which does not now exist, and not exhibit the kinds which do exist, if both were created simultaneously, in their precise respective forms : and yet, without entering into particulars, I may safely assert that, as to many races of animals and plants, the fossil species are not found in the present day. We must try, with humility and piety, to reconcile apparent facts with the revelation of God

that has been handed down to us : we must remember, that as the Bible contains the only and the whole word of God, and is the sole record of His will and of the doctrine He has delivered to us, and stands in that respect alone, unrivaled, and invaluable, it is not the sole, nor even the most certain, record He has given us of ancient natural facts ; for the remains of the old world, which He has preserved in such wonderful perfection by His power and wisdom, are infallible documents, handed down by His almightiness for our instruction and edification ; and, although we must not indulge in presumptuous speculations and conclusions drawn from them, the facts which they exhibit are even more certain than the words in that precious and invaluable volume which relate to things only mentioned incidentally therein, and not affecting the great object for which the Bible was given to man—namely, the declaration of the will of God, and the relations between Him and ourselves. We have, in the history of Egyptian hieroglyphics, a memorable instance of the gross stupidity of mankind in understanding words. A distinguished Greek ecclesiastic had expressly written that they exhibited the first elements of words. For sixteen hundred years the meaning of that expression continued to be a riddle, and the most wild and absurd theories were advanced in the attempt to explain it ; no schoolboy was asked “ What are the elements of words ? ” and answered, “ Letters, to be sure ! ” and no person discovered that the first elements of words were their initials, till a sentence was accidentally found written in letters as well as in hieroglyphics. I may therefore safely say, that the image of substantial bones stamped by the will of God in ancient days upon the solid rock, unchanged and almost unchangeable, are more certain documents as to old facts than any written record ; because we now see the former as they are and were impressed by the dispositions of the Almighty, and we may quite misunderstand the meaning of the latter. When we look to doctrine and the will of God, we have nothing but the inestimable volume of the Bible to consult ; and yet we lament to find how unable even its most precious words are to bind mankind in an uniform and consistent understanding of their import, and of the things absolutely necessary for our salvation ; and, excepting the fact that everything was made by God, they testify very little concerning the things and creatures with which He peopled the world in the first ages, and that so loosely, that our understanding could not rely upon our interpretation of its meaning, in opposition to the imperishable memorials He has handed down to us, if they should seem to disagree ; but, in truth, when rightly examined, they do not disagree.

According to the scriptural statement, God created vegetables before the existence of the light of the sun and moon, or the present course of night and daylight ; at a latter period He created the birds and aquatic animals from the sea, including under that name (see Gen. ii. 19) the wet soil it covered : and, at a later period, land animals from the earth, which had

then become fit for their production : and He ordered them to yield fruit and seed, and to bring forth after their kind—"cattle, and creeping thing, and beast of the earth, after its kind." Here arises a great question, which has never been properly considered :—What is their kind? Zoologists and botanists divide vegetables and animals respectively into genus and species. Species means form or appearance ; and genus means a kind. Therefore, according to the words in use amongst us, we are to understand that God created the genera severally, and ordered them to multiply within the generic limits. And what are even generic limits? According to the new lights of science, those limits are varying every day ; and no two botanists or zoologists are agreed about them : and we have no record of the origin of specific diversities. But botanists have higher divisions ; they have tribes, alliances, orders, &c. ; and who shall venture to say that the limitation, which the Bible calls a kind, was not that which modern penmen in Europe have thought fit to call an order, or a tribe. To me it seems that the Bible itself appears rather to indicate that it does not mean one of the lower subdivisions, where it adds, as an explanation, "cattle, and creeping thing, and beast of the earth, after its kind : " which might signify, that cattle shall not yield a creeping ; a beast of the earth (that is, a cat or tiger, &c.) shall not yield cattle—*i. e.* a cow or sheep, &c. ; a snake shall not yield a bird or a fish : and beyond such a general outline the Bible history speaks not to man on the subject of the propagation and diversification of races. It is a subject open to inquiry. It is not said that God made each beast, but "the beast of the earth after his kind." We are left to our own inferences and experiments, and to the examination of the organic remains God has bequeathed to us, in order to acquire temporal knowledge on such points ; which, as we acquire it, will lead us more and more to adore the infinite wisdom and power of God ; but is entirely unnecessary to the great object of holy life and the acquisition of eternal salvation, and therefore of a nature which the All-wise did not think fit to communicate to us authoritatively. Upon all such matters, therefore, we have liberty to speculate and reason, with piety and humility, according to the gifts God has given us, for the good of mankind, and for His own glory.

I will therefore state, briefly and humbly, what is the general bias of my surmises as to the diversification of vegetables, to which that of animals must be in a certain degree analogous. We know that four races of men have branched out from one stock,—the white, the black or African, the brown or Asiatic, and the red, with various subdivisions of aspect amongst them, and we know nothing of the mode or time in which those diversities arose. Revelation and history are equally silent on those facts. They must have occurred very early. Jupiter is said to have visited the *Æthiopians* ; and M. Faber has proved that the things recorded of ~~Jupiter~~ relate to the period which immediately followed the deluge. We may therefore assume

that such changes began in the lifetime of the sons of Noah, or were immediately consequent on the dispersion of mankind. We are equally in the dark as to the races of dogs. Old writers allude to different kinds of dogs, and we do not know when or how any one of those we possess originated ; and the same may be said with respect to the origin of languages. From these facts I draw this inference, which seems to me incontrovertible, that a course of change was in operation in the early ages after the deluge, which had ceased, or at least was greatly diminished, before the era at which our knowledge of events began to be more precise, and handed down by writing. I shall be told that these different races of men breed freely together, and that these dogs intermix, and produce mongrels also, and that we see thereby that they are only varieties of one kind. Granted ; I entertain no doubt of their having respectively descended from one pair of created individuals ; but how do you prove to me that the cat, lynx, tiger, panther, lion, &c., did not descend from one created pair ? I am rather inclined to think that they did (but this is only a surmise), and even the horse and the ass, from one created pair ; and I am quite unable to believe that the several sylvia of the wren family, some of which can with difficulty be distinguished except by the proportions of their quills, and which have nevertheless very diverse habits, notes, and nests, were created separately and specially ; and, when I look to the vegetable races, I am still more unwilling to assent to the assertion, that every plant, which this or that botanist has called a distinct species, or even a distinct genus, had a special creation in the period before the sun and moon shone upon this world, when God created vegetables. Upon what authority is such an assertion made ? Upon none but the dictum of those who are pleased to inculcate it. Upon what ground is it made ? Upon none that will bear investigation,—upon a rash assumption that every thing cross-bred is sterile, and that if the offspring is sterile the parents are thereby proved to have been descended severally from the Creator. In the first place, the fact is even false as to animals. Buffon records an instance of the fertility of a mule. I have seen that which I am satisfied was a hybrid between a bitch and a fox, which was the father of many puppies. But if the fact were positively true, how is it to be proved that the constitution and frame may not have undergone such changes in the diversification as to prevent intermixture ! If I can show that in one genus of plants cross-breeding is not only easy, but more easily obtained than fertility by the plant's own pollen, and that in others, so closely allied to it as to make it a question whether they are not sections of one genus, cross-breeding cannot be effected generally, and in no case easily ; that in some genera of plants many or all the cross-bred varieties are fertile, and in others nearly allied thereto all, or almost all, are sterile ; the assertion that the races of canis or dog must have had one origin because their crossed produce is fertile, and the races of felis, from the cat to the tiger, must have had separate

origin because their crossed produce is sterile (supposing the fact to be true, which is not ascertained), must fall to the ground. The only thing certain is, that we are ignorant of the origin of races ; that God has revealed nothing to us on the subject ; and that we may amuse ourselves with speculating thereon, but we cannot obtain negative proof, that is, proof that two creatures or vegetables of the same family did not descend from one source. But we can prove the affirmative ; and that is the use of hybridizing experiments, which I have invariably suggested ; for if I can produce a fertile offspring between two plants that botanists have reckoned fundamentally distinct, I consider that I have shown them to be one kind ; and indeed I am inclined to think that, if a well-formed and healthy offspring proceeds at all from their union, it would be rash to hold them of distinct origin. We see every day the wide range of seminal diversities in our gardens. We have known the dahlias from a poor single dull-colored flower break into superior forms and brilliant colors ; we have seen the carnation, by the reduplication of its calyx, acquire almost the appearance of an ear of wheat, and look like a glaucous plant ; we have seen hollyhock in their generations branch into a variety of colors, which are reproduced by the several descendants with tolerable certainty. We cannot therefore say that the order to multiply after their kind meant that the product should be precisely similar to the original type ; and if the type was allowed to reproduce itself with variation, how can we pretend to say how much variation the Almighty allowed ? Who can say that His glorious scheme for peopling and clothing the earth was not the creation of a certain number of original animals and vegetables, predestined by Him in their reproduction to exhibit certain variations, which should hereafter become fixed characters, as well as those variations which even now frequently arise and are nearly fixed characters, but not absolutely so, and those which are more variable and very subject to relapse in reproduction.

Let me suppose that the Almighty perhaps originally created an individual plant of each natural order extinct and existing, supposing the natural orders to be correctly set forth, and rectifying the errors which may require correction. What proof can be offered that more individual vegetables were originally created ? None ! It will perhaps be asserted that the several individuals of different species or present form, which are included in one order, could not have descended from one original mother, because either they will not breed together, as is usual with individuals of the same species ; or, if they do, their offspring is sterile. Such used to be the assertion ; but it was bare assertion, unsupported by proof. In the first place, the fact is false in numberless instances ; in the second, if it were true, what proof can be given that no two things descended from one origin can have become so diversified as to be now incapable of a fertile union, or of producing that which will be fertile ? We are utterly in the dark as to the mystery of

fertilization. We know not by what wonderful secret contrivance the unsearchable wisdom of God has prevented the minute and almost imperceptible grains of pollen from usually fertilizing any ovary but that of its own or of a kindred flower; and how can we presume to say that structural and constitutional differences may not have arisen amongst vegetables which have diverged from one origin, rendering the fertility of their sexual union in some cases difficult, in others impracticable?

I have had no opportunities, by the help of a powerful microscope, of pursuing any investigation into the process by which the pollen fertilizes the ovules; and I have somewhere stated, that, although I could not pretend to contradict those who asserted that the grains of pollen from their own bulk emitted tubes which reached from the surface of the stigma to ovules in the germen, sometimes as in *Hymenocallis pedalis tubiflora*, 12 or 13 inches distant, and in others where the germen is subterraneous at an uncertain distance, my understanding would not assent to it: my objections were twofold: first, that it did not appear possible that such a minute body should emit a tube of such length, through which its contents were passed into the ovary, as asserted. Secondly, that in all the wonderful contrivances of Almighty wisdom to effect apparently difficult purposes, I had perceived that no *unnecessary* complication of machinery was used. It seemed to me preposterous to imagine that the All-wise would employ such almost miraculous tubes to convey the contents of the grains of pollen into the ovary without conducting them to the ovule itself, when they might have been as securely delivered by passing directly from the pollen into the passage through which the tubes were to advance without such secondary conductors. It was as if an engineer, after leading water for miles from the mountains in pipes, should at last turn it into the valley, to find its way as it might into the cistern he was desirous of supplying. I understand that further observations tend to the establishment of the fact that the tubes, instead of terminating abruptly, as before asserted, do actually reach the foramen or aperture of the several ovules, and obtain admittance through the mouth thereof. I have not witnessed this phenomenon, but I am willing to believe in it, because it is perfectly consistent with the apparent wisdom of God in all his works; but I think those who have broached the facts have not understood the operation, and it seems to me to yield the key to a great part of the mystery in which the subject of vegetable fecundation is involved. I therefore recur to my first objection, that it is utterly impossible that such a minute body should emit such a pipe and its contents, that is, emit it of its own substance; and I apprehend the fact to be, that by contact with the juices of the cognate plant it acquires that which enables it to gain bulk for such an elongation. I conceive that the abstraction of something, perhaps carbon, from the juice of the stigma, is necessary to that increase of bulk, and in some cases that atmospherical moisture is essential to it. Hence it arises that old pollen

which has been kept perfectly dry may act so as to fertilize, but that which has been once damp cannot do so, because it has been carbonized and has discharged its office, and is incapable of acting a second time. But the probability is, that, although mere moisture may have a certain effect on the pollen, there is some more chemical union between the grain of pollen and the juice of the plant necessary to carry the duct to its distant point of reception, and enable it to cry "Open Sesame," and make good its entrance when it arrives there. It has, I believe, not been duly considered, that the fecundation of the ovules is not a simple, but a complicated process. There seem to me to be three or four several processes—the quickening of the capsule of the fruit, the quickening of the outer coats of the seed itself, and the quickening of the internal part or kernel, and the quickening of the embryo.

Whoever tries to raise mule *Alstroemerias* from *A. aurea* by some cognate species, will find, under favorable circumstances, every flower produce a full-sized perfect capsule, though he may fail in obtaining the least enlargement of the ovules. A mule raised by Mr. Bidwill between *Passiflora cœrulea* and *onychina* flowered this summer in my conservatory, and produced of itself, to my surprise, two fine plump fruits, two inches long, of a bright orange color, there being no other *Passiflora* in flower at the time on the premises. On opening its beautiful fruit, it proved to be empty as a bladder, the outer coat of the fruit only having been fertilized in consequence of the weakness of the cross-bred pollen. In other attempts at cross-breeding, or in plants that do not make seed freely in our climate, he may find not only a perfect capsule, but seeds grown to full size, though containing a perishable lymph, and no sound kernel. In others he may find the seed either of an undue texture and substance; or, if apparently good, deficient in embryo. In some cases, as in the very extraordinary one first noticed by Mr. Brown with respect to *Hymenocallis*, the seed having no discoverable embryo when first ripened, acquires one after lying for some weeks or months on the earth. It follows, therefore, that a continued operation of the pollen must be necessary to produce all these requisites for the formation of a good seed. It has been said that, when the ovules are fertilized, the outer coat or capsule begins to swell. This does not appear to be true; for the capsule often becomes perfect, though the ovules do not seem to have become fertilized at all. It seems, therefore, a process independent thereof, whether simultaneous, antecedent, or posterior; so must the fertilization of the seed-coats and of the albumen be, since they may grow without an embryo; and some mysterious process must be continued to vivify the embryo at a later period, since it can elude the microscopic research of Mr. Brown in a seed so large as that of *Hymenocallis*. I have cut open seeds of *Hymenocallis* an inch and a half long, and found no visible embryo, but a large cavity; yet the rest of them, being left in the damp ground, acquired visible embryos, and sprouted

some months after. If, therefore, as I apprehend, the pollen tubes cannot reach the ovules without deriving substance from the cognate juices of the style through which they descend; it becomes easy to understand how there may be sufficient affinity between them to carry on the process to the degree necessary for quickening the capsule, but not to carry it on to the point requisite, and with the excitement and irritability necessary for reaching the ovule, and stimulating it to open its aperture for the reception of the substance conveyed by the tube from the interior of the grain of pollen. It is also easy to understand how moisture, either to feed the plant inwardly, and make its juices abundant, or to affect the stigma outwardly, may be necessary to the fertilization of the ovules. If a chemist could analyze the pollen before application, and the tubes after, perhaps it would appear that the pollen is deficient, and, in order to be available, must be deficient in some one of the ingredients which will be found in the tubes. If it be true, as I imagine, that it is necessary for the pollen to derive from the style some chemical adjunct to increase its bulk, and to enable it to irritate the aperture of the ovule and obtain access, it will become manifest why it is, that in some genera intermixed produce is easily obtained—in others not; because it depends upon the close similarity of constitution and chemical relation of the component parts of the two plants. We can easily understand that the individual which, on a hot and barren soil, dwindled, after the dispersion by the deluge, to a slender annual, may have acquired such different chemical qualities, that it has not now sufficient affinity to the species which in a moist and luxuriant position has become the master of a forest, twining its colossal arms round the loftiest of its inhabitants; while two other species, though very different in some striking points of conformation, may have such constitutional similarity, and such identity of component ingredients, as to have precisely the same chemical affinities and intermix readily. Why is it that in the genus *Hippeastrum* all the several natural species, forms, or varieties of that plant (I care not by what title their variation is styled) breed more readily by the pollen of any other, however complicated by cross-breed, than by its own; and that in the genus *Habranthus*, most closely allied to it, every attempt to cross the several natural sorts has as yet entirely failed? The facts are so. Why is it that in the genus *Zephyranthes*, closely akin to *Habranthus*, and making seed freely, crosses are obtained with much difficulty, and when obtained, are rather disposed to sterility? I cannot answer those questions, further than by saying that the ways of the All-wise are past finding out: but I can surmise that in the genus *Hippeastrum* there is a great sameness of constitution, and that the pollen finds in the style exactly that which is requisite for the growth and development of its tubes, and that the pollen of a fresh individual with the same chemical properties gives a more powerful stimulus, as the introduction of a fresh cross has been found to do amongst animals; and that in the two other genera there is less

sameness of constitution, greater difference in the proportions of the component parts of their juices, and the pollen is not suited with what it wants for the purposes of fertilization. I suspect, therefore, that it is by the nice adaptation of the juices of each individual type to yield the exact proportion of what is wanted for the pollen of its kind, that the Almighty has limited the races of created things ; and that, wherever that adaptation is perfect, a perfect offspring is produced. Where it is not perfect, an inadequate or a weak fertilization takes place. It is further to be observed, that there is frequently an imperfect hybrid fertilization, which can give life, but not sustain it well. There are several crosses which I have repeatedly obtained, but could not raise the plants to live for any length of time. I obtained much good seed several years ago from *Hibiscus palustris* by *speciosus* ; I sowed a little each year till it was all gone ; the plants always sprouted, but I saved only one to the third leaf, and it perished then. I have never raised, beyond the third or fourth leaf, a cross between *Rhododendron ponticum* and an orange *Azalea*, though I have saved two or three through the first winter. My soil, however, is very uncongenial to them, and under more favorable circumstances they would have been saved. From *Rhodora canadensis* by *Azalea pontica* (sections of genus *Rhododendron*,) I saved ultimately only one out of more than a hundred seedlings, and that became a vigorous plant. Such crosses sometimes are a hundred times more delicate in their first stage than natural seedlings. Mr. Bidwill, in attempting crosses at Sydney, has also (as he informs me) raised some with difficulty, which have invariably perished. In these cases I apprehend that, although the affinity of the juices is sufficient to enable the pollen to fertilize the ovule, the stimulus is insufficient, the operation languid, and the fertilization weak and inadequate to give a healthy constitution. It has been generally observed that hybrid fertilization is slower than natural fertilization, and that often a much smaller number of ovules are vivified. The same cause probably operates in that respect : the affinity not being perfect, the necessary ingredients are attracted by the pollen less readily and insufficiently, and by many of the grains not at all.

It appears that if two stigma-bearing lobes of a triple or even tripartite style are cut off, the whole germen may be fertilized by the one left. In such cases, therefore, the pollen tubes from one lobe must be able to penetrate all the cells of the germen. In cases such as I have seen, where both natural and hybrid seeds have been produced in one capsule, I cannot state whether the two sorts of pollen acted through the same or different lobes. I have in no instance succeeded in obtaining any multiplicate cross by blending the pollen of two or more kinds intimately before their application. Mr. Knight thought he had given at the same time the curl of one cabbage and the red colour of another to a third variety. My invariable failure in such attempts induces me to think his recollection was inaccurate, if he meant that he had

done so at one fructification. He might easily have obtained the twofold features by two successive crosses, but I believe not in one generation, by simultaneous application of different pollens : for I do not think that two grains even of the same pollen can get effectual access to the foramen of one and the same ovule. I now understand, nearly at least to my own satisfaction, in what manner the pollen of *Rhododendron* may in the fertilization of the ovules supersede the pollen of *Azalea* previously applied ; because I do not believe that they are always fertilized so soon as has been usually supposed. The stimulus may have been given to the germ or outer coat of the seed-vessel, and yet the fertilization may not have reached the ovule, and the operation which produces a living embryo may remain suspended till a change of weather and a moist atmosphere afford a supply of carbon, or whatever is needful thereto ; and therefore that pollen which has perfect affinity to the plant may develop itself effectually at a later period on a change in the state of the atmosphere ; but, when the pollen has once reached and stimulated the foramen, further access will be assuredly denied. I have repeatedly observed in dry seasons the pollen of *Rhododendron* very parched and seemingly deficient, the stigmas dry, and the germens remaining for weeks nearly stationary after flowering, as if no seed would be produced ; but upon a change of weather inducing moisture, universal fertility of the pods soon became apparent. I suspect that in such cases the fertilization has remained incomplete from want of the food necessary to the elongation of the tubes. If such views have any foundation in truth, it is possible that, in addition to mere water, a supply of the chemical ingredients which are the food of plants to the style may facilitate difficult impregnations. It is certainly desirable, where dry pollen is to be tried, to moisten the stigma to which it is about to be applied.

Having made these preliminary observations, I will try to recapitulate the facts that seem to be ascertained. It is now forty years since I began experiments on this subject, which have been, not an employment, but an occasional source of amusement. My original assertion was, that the genera of plants (rectifying in the limitations and definitions thereof by botanists such things as shall appear to require rectification) represent the several created types of vegetables ; that such created types cannot properly amalgamate ; and that, if a monster is at any time produced between them seminally, it cannot be seminally reproduced ; that the species of botanists and the permanent local varieties are not essentially different in their nature, but are variations induced by causes more or less remote in the period of their operation, though the features of their diversity may be severally more or less important, and that they differ from accidental varieties in the permanent habit of similar reproduction which they have acquired from soil and climate, and that often in a long succession of ages. Those points appear to me now completely established, excepting that we cannot prove that even the genera

did not branch out from higher types, or in fact that the tribes or orders were not the original genera, or kinds. In some genera we find that all the species are capable of breeding together and producing a fertile offspring : in *Hippeastrum* that they even prefer breeding with each other ; in some genera that many species will cross together, and some have as yet refused to cross ; in some, that the cross-bred plants are abundantly fertile ; in some obstinately sterile ; in some individuals capable of fertilization by the pollen of another, and not by its own ; in some cases that two individuals will breed freely with a third, and not with each other.

To what results do those facts lead us ? The promiscuous blending of the species of any one genus proves that the sterility or impediment to intermixture does not depend upon any original created diversity of species—i. e. that the thing called a species by botanists is not the created type ; and, if the fertility does not depend upon that, the various results must depend upon the want of equal affinity amongst the several species of each respective genus—that is to say, on a wider departure from the common type in the several varieties of one genus than in those of another. We cannot suppose anything so preposterous as that the Almighty would have created so many species of a genus, with permission, when approached together by the hand of man, to confound their generations, and so many others under a peremptory prohibition to do so. Therefore, if by a genus we mean anything definite, anything that has a real and natural character, and not merely a fanciful and capricious denomination, whatever be the nature of the individuality which absolutely and essentially separates one genus from the rest of the creation, must also exist in every other genus ; so that, if the species of any one genus are variations generated from one original type, the species of every genus must respectively have descended from a peculiar type ; otherwise it would be apparent that the same thing is not meant when the words genus and species are used in the one case and in the other, and that the application of the words is vague and unscientific. If I have shown that the species of one genus are convertible, and therefore of one origin, I have shown that every genus must have had one original type, unless the genus which I bring in evidence shall appear to be in truth a division of an inferior grade, and not deserving of the name of a genus. Let us, therefore, inquire how the fact stands. It so happens, as if expressly to prevent the possibility of any doubt on that point, that the genus in which I have lately produced the proof of the most marvellous convertibility, is not only a valid genus, but embraces greater structural differences than any genus amongst the seven or eight thousand that have been defined—I mean the genus *Narcissus*, which, on account of those diversities, had been subdivided into a number of genera ; which supposed genera have been found capable of breeding together and re-crossing, so that not only intermediate forms can be originated, but one even of the supposed genera can be obtained in two or three generations from the capsule of another.

This cannot stand as an isolated fact. It holds out a warning to all botanists, that on closer investigation it will be found, not merely that the genera of plants duly modified are the descendants of individuals which have branched into variations, but that a great portion of the seven or eight thousand are not even real individual types, but sections of a genus or kind embracing a certain class of variations, which have peculiar affinities to each other, and which in many, perhaps in most, cases cannot now intermix with plants of another section. The circumstances of the genus *Crinum* do not speak with less force as to this point. When I first introduced and described a number of species of *Crinum* which had not been known before in Europe, I was greatly censured by some experienced botanists for asserting that plants, which they held to be species of *Amaryllis*, were in fact variations of the genus *Crinum*, and it was even declared that *Crinum* was more nearly allied to *Pancratium* than to the species in question. I proved the justice of my botanical view of that point by obtaining not merely sterile mules, but a fertile offspring between the Common Cape *Crinum*, which was before erroneously called *Amaryllis longifolia*, and the great *Crinum pedunculatum* of New Holland. I have now in my garden a further seedling from such a mule, between the *Crinum Capense* and *Crinum canaliculatum* which is closely akin to *pedunculatum*, with ripe seeds upon it. Generally these mules become impregnated by the pollen of *Crinum Capense*, of which a great bed stands near them, and the offspring being two-thirds *Capense*, revert nearly to its aspect; but the plant above-mentioned did not revert, but exhibits an improved form of the mule, and is in fact a new fertile species. The freedom with which species of *Crinum* of the old Linnæan section and most of the section I added thereto interbreed, furnishes decisive proof that the facility of intermixture is not confined to genera in which species have been rashly formed out of seminal varieties, but is found when the species were even erroneously considered to be of different genera. There is every reason to believe that *Thuja* and *Cupressus* have bred together, and those who look to the small difference between them will become satisfied that they form two sections of one genus. *Sinningia* has been crossed with *Gloxinia*, and the produce is capable of being crossed again. They are indubitably of one genus or original kind; and perhaps not the only, but *Gesnera* also and *Achimenes*. When we look to the botanical characters, the characters of very many genera, of which all the species are not generally cultivated, are frequently false as to matter of fact, because opportunities have not occurred, or have not been carefully used, of comparing all the species in a live state, and in dry specimens the truth cannot be always ascertained.

Therefore, if it be admitted, that there is little probability of obtaining a cross between two plants generically distinct, it does not follow that it would be needless to attempt an intermixture between all that bear and have long borne different generic names. Some observations on the inaccuracy

of the views of Martius and De Candolle concerning the Gesneraceæ, as stated in the Bot. Reg. 1845, 3, will illustrate my meaning. The question arose in that article, whether the subject was to be called *Gloxinia* or *Gesnera tubiflora*. I have premised that the separation of *Sinningia* from *Gloxinia* has been disproved by the crossed produce, which even bears seed. First, then, as to *Gesneria* or *Gesnera*, the alternative of "five protuberances at the base of the corolla or an equal swelling all round," is no generic distinction, if the swelling of the base is to furnish such a distinction compared with a protuberance on one side. These protuberances depend in part upon the relative posture and inclination of the calyx and tube. They are so various in different species, that *Achimenes patens* has a long spur projecting from the prominence of the base. A like objection applies to the definition, "two or five glands round the ovary," which shows that the thing set forth, as the fixed and determining character, is a varying feature. Proceeding to the definition of *Gloxinia*, we find, 1. *calyx equal*, as distinguishing it from *Gesnera*, with *calyx somewhat unequal*. The fact is not so. The two upper lateral segments in *Gloxinia speciosa* and *hirsuta* have a disposition to be smaller than the others. The calyx of the order consists of one upper segment and two pair of laterals, and there is often a little and not very certain difference between the two pair. Their relative size is manifestly unsteady. 2. Corolla protuberant on one side only of the base. It will be found that the protuberance varies in the species according to the greater or less depression of the corolla. In *Gloxinia speciosa* it is bent downwards so rigidly, that the base can only swell upwards. In *Gloxinia hirsuta* the corolla is not depressed and the base is very different. Proceeding to *Achimenes*, we find an assertion utterly unfounded, that the anthers are separate, being united in the two former genera. I have before me the anthers of *Achimenes coccinea*, *pedunculata*, *hirsuta*, &c. all as closely attached together as those of any *Gesnera*. I have also seen a few flowers in which they were separate, but I believe in a barren and imperfect state, and I find them more ready to part when they decay. Having disposed of those false facts, let us see what distinctions remain. *Gesnera*, corolla tubular. *Gloxinia*, funnel-shaped, or somewhat bell-shaped, inflated in the middle. *Achimenes*, tubular and funnel-shaped. Those differences, if correctly stated, would only show that there is a variability in the swelling of the tube in different species, as there is in a much more decisive manner amongst the various species of tropical Convolvulaceæ in the genus or section *Pharbitis*; but those facts are also incorrect. The corolla of *Gloxinia hirsuta* is not inflated, but nearly cylindrical, with furrows; on the other hand, that of *Gesnera zebrina* and *Geroldtiana* is immoderately inflated, and nearly similar in form to that of *Achimenes pedunculata* and *hirsuta*. What remains? Nothing between *Gesnera* and *Gloxinia*; a ring round the ovary to *Achimenes*. I can however point out one, which has not been noticed, of consi-

derable importance between the fruit of *Gloxinia* and *Gesnera* as applicable to *Gloxinia speciosa* and *hirsuta*. The fruit erect. *Gesnera*, the fruit sub-horizontal, with a beak curved a little upwards and a different dehiscence. Again : *Gesnera*, calyx adpressed. *Achimenes*, calyx patent. No person can compare *Gesnera zebrina* and *Geroldtiana* with *Achimenes pedunculata* and *hirsuta*, and not see that they are much more closely allied to the latter than to *Gesnera faucialis* and *bulbosa*, and others which have the upper portion of the limb prominent and incurved, while that of the former is short, two-lobed, and recurved : but the calyx of *Gesnera rutila* is neither patent nor adpressed ; the calyx of *Gesnera Geroldtiana* has the upper lobe of the calyx not adpressed, while that of *faucialis* is closely adpressed ; therefore, if these characters are so important, another genus must be formed for *Gloxinia hirsuta* and another for *Gesnera zebrina* and *Geroldtiana*. The fruit of *Gesnera tubiflora* is horizontal, and I have no hesitation in saying that it does not conform with *Gloxinia speciosa*, but approaches rather to *Gesnera zebrina*, having the tube however less inflated. Here then we have a beautiful race of plants which are in cultivation, concerning which the most skilful botanists are quite adrift, and which lies open to experiments on the part of those who have opportunities of testing their respective individuality.

The genus *Lycopsis* is distinguished specially by Endlicher, as having the stamens included in the tube. I brought from Cephalonia a pretty unknown *Lycopsis* (*L. sanguinolenta*, *mihi* ; staminibus non inclusis, limbo albo maculis sanguineis, foliis variegatis), scarcely distinguishable from *Lycopsis variegata* in its singularly variegated foliage, but having the stamens not included in the tube. I entertain no doubt of the possibility of crossing it with *Lycopsis variegata*, or of their joint origin in times long bygone. Let the cultivator therefore not be discouraged by every nominal generic separation, but let him take his own view of apparent affinities, and bring the accuracy of those separations to the test. It has not been unfrequent with eminent botanists to speak of the convenience of uniting or separating some plants generically ; a remark which I can never observe without dissatisfaction. If botanical distinctions are matters of convenience, and not the limits assigned to His created works by the Almighty, and investigated by the humble researches of human science, the botanist is degraded to the mere character of an index-maker. It is a matter of convenience and useful to separate extensive genera, which have various subordinate forms, into sections and sub-genera, to which names may be affixed ; but we render the book of botany a deceptive tissue in inconsistency if we lose sight of the fact that the genus or generic character is (or, according to our amount of knowledge, is presumed to be) the definition of the limitations of the created type, and confound the sub-divisions made by us for convenience with the natural divisions that originally proceeded from the Divine Artificer. I

will exemplify this rather from my own immature views than from those of others, though the evil is of rapid growth amongst those to whom botany is a study and profession, and not, as to me, an occasional amusement, which has been often neglected for months and even years together. Perceiving that the plants called by me *Choretis* differed from *Hymenocallis* by the insertion of the filament into a callus on the anther, I inquired of those who were much better informed than myself whether such a difference existed amongst the species of any well-ascertained and accepted genus, and no such genus could be brought to mind. I therefore, though with great hesitation, separated generically *Choretis*, which differed also like *Ismene* in bearing a globular seed that produced a bulb underground, not vegetating upwards till after a season of rest. I am now satisfied by the cross-breeding in the genus *Narcissus*, of which the sections (supposed to have been genera) are distinguished by greater diversity of stamens, that *Choretis* is not a genus, but a sub-genus or remarkable section of *Hymenocallis*. In the like manner I am satisfied that my late brother's gardener, Mr. Carton, now residing with the Duke of Northumberland, raised at Highclere two beautiful mules between *Hymenocallis speciosa* and *Ismene calathina*, and I am thereby convinced that, notwithstanding their diversity of form and habits, *Ismene* is also to be considered as a sub-genus or section of *Hymenocallis*. Such is the rectification of my own botanical views : but the matter does not rest there. If I have here retrodden my steps justly, the professors of the science on all sides must check their course a little, and retrace an infinity of crooked windings, and look not merely to petty differences, but to the general bearing of their sub-divisions. This very day a statement has issued from the pen of a most able botanist, that *no doubt can exist* of the propriety of accepting the generic separation of *Spartium spinosum* of Linnæus, alias *Cytisus spinosus* of Lamarck, as called *Calycotome spinosa* by Link, on account of "deciduous teeth and a truncated membranous edge to a calyx subtended by a bract," and its ranging with "stiff, spiny, yellow-flowered bushes ;" and the establishment of a genus *Retama* for some sorts of *Spartium*, *Syspone* of *Genista*, *Lembotropis* of *Cytisus* ; and the restoration of *Laburnum* as a genus is approved. I have not a word to say against the establishment of such subordinate classifications, as a matter of convenience ; but if it is meant to exalt such distinctions into genera or original limitations of kinds created by the Almighty, I must protest against it as a total subversion of the true substance of botany ; and I am persuaded that my distinguished friend does not so mean it, and has not sufficiently considered the consequences of thus blending great and insurmountable separations with lesser and subordinate variations. We have actually a mule between *Cytisus Laburnum* and *purpureus*, of which I shall speak more particularly, and those he proposes at this time of day to separate generically, for I presume that *Cytisus purpureus* will not fall under *Laburnum*. I hope that

these observations may tend to draw the attention of botanists to the invaluable aid the results of cross-breeding afford to their labors, at the same time that they may excite the cultivator of plants to take the high station he ought amongst the scientific investigators of the glorious creation by which Almighty God has surrounded him.

Hippeastrum and *Narcissus* are, I think, the genera in which the most remarkable convertibility of species has appeared. In the former genus no impediment has occurred in the intermixture of any of the various natural forms. Seed, when obtained, from *Hippeastrum reginæ-vittatum* has reproduced the cross-bred flower, though usually of rather inferior size. It is, I think, desirable to enter into special details. I stated (*Amaryllicaceæ*;) that I had found flowers of every cross-bred kind of *Hippeastrum*, after its stigma had been touched with the pollen of another bred by a different cross, produce seed abundantly; while those on the same stem, which were touched with their own pollen only, either failed to produce seed, or produced few, and those in a capsule very deficient in size and vigour. The observation of several years enables me now to say that this remarkable fact is almost invariable, and that, although the hybrids in this genus are capable of bearing seed by their own pollen, the admission of the pollen of another cross-bred plant of the same genus (however complicated the cross) to any one flower of the umbel, is almost sure to check the fructification of the others, so that the excision of the anthers in such case is quite superfluous, the difficulty being to get the individuals to fertilize their own germens. This remarkable fact led me to try a further experiment, and the result has brought to light a startling fact, that in the same genus the pollen of a cross-bred plant can even overpower the natural fertilization of a wild bulb of an unmixed species. For this experiment I chose a bulb lately dug up by Mr. Gardner, on the Organ Mountains in Brazil, and sent to me by the kindness of G. Wailes, Esq., of Newcastle; closely allied to *H. aulicum*, of which it may be called var. *Organense*, or, if it be separated as a species, *H. Organense*, having the scape usually two-flowered, the red not intense or shining as it is in *Aulicum*, and the screen in the throat ragged and half-bearded. The very bulb lately dug up in Brazil was used. It produced two two-flowered scapes; the first pair of flowers were touched with their own dust, and the germens swelled; of the second scape, which was several days later, one flower was touched with its own, and the other by the dust of a fine triple cross from *H. bulbulosum*, var. *pulverulentum* by *reginæ-vittatum*, otherwise called *Johnsoni*. The ovaries of the three flowers impregnated by the natural pollen for a few days after the decay of the last flowers appeared to have the advantage, and the fourth continued smaller, and seemed likely to fail, when it unexpectedly made a rapid advance, and immediately the three others ceased to grow, and after a few days perished entirely; while the progress of the pod impregnated by the mule made vigorous and rapid progress to maturity, and

bore good seed, which vegetated freely. The impregnation by the cross-bred pollen was therefore slower in taking effect, but had the same decided superiority over the pollen of the natural species as over that of any other cross-bred variety. The anthers had been taken out of the flowers before their expansion. This is a strange truth, and the more remarkable from the difficulty of obtaining cross-bred seed at all in the genera which are most nearly related to *Hippeastrum*, namely, *Habranthus* and *Zephyranthes*. Where no access from the dust of another individual is admitted, the hybrid *Hippeastrum Johnsoni* is capable, as I have stated, of reproducing itself by seed. A bulb of *Solandriflora-Johnsoni*, of which all the flowers were set by their own pollen, produced seed vigorously from all of them.

My experiments among the Narcissean bulbs have produced still more singular results, which have been partly detailed in the Botanical Register. It will be recollected that in examining the various genera which had been carved out of *Narcissus* by Mr. Salisbury and Mr. Haworth, I discarded some of the separations as inconsistent, or founded upon trivial features; and that I retained, as distinct from each other, *Corbularia*, with declined assurgent filaments; *Hermione*, with very small oval anthers, almost sessile, and incumbent on decurrent filaments, with short incurved points; and *Ajax*, with very long, linear, erect anthers and stout filaments, in great part fec. These plants, viz., the hoop-petticoat, the daffodil, and the *Polyanthus narcissus*, are separated by features which, as far as my research extends, I can find united in no other genus of plants. With much greater hesitation I assented to the division of *Hermione* and *Ganymedes* from *Narcissus*, in which the differences, though of a like nature, are far less marked. There was still another separation of *Queltia*, of which there were two divisions, one with larger anthers coming nearer to *Ajax*, and one with smaller anthers including the jonquil. In the progress of my investigation I found that no person could furnish me with the seed of any *Queltia* of the class with larger anthers; and, although wild localities are attributed to several of them, it did not appear that they had been observed to increase there or elsewhere by seed. On looking back two hundred years, to the time of Clusius, it appeared that he could not point out the place of their growth, but had received some expressly from a garden. A strong doubt had suggested itself to my mind whether these anomalous species were not garden hybrids produced above two hundred years ago, and admitted as natural species by botanists who did not suspect their origin. On the other hand, no plants divided by such strong features of structural difference as *Ajax* and *Narcissus* or *Hermione*, had yet been found capable of breeding together. I had instituted a course of experiments to bring this mystery to light before the publication of my treatises on *Amaryllidaceæ* and hybrid vegetables, but the results were not sufficiently verified to make me think it advisable then to broach the subject. I will now state the facts and the course of my experiments. The macrantherous or

large-anthered *Queltias* consist of five species, with their varieties :—1. *Macleayi* ; 2. *Montana* ; 3. *Incomparabilis* ; 4. *Orientalis* ; 5. *Odora*. *Macleayi* and *Orientalis* have not been ascertained to have been found anywhere in a wild state, and it is not stated that any person has known either of them to have produced seed.

Montana is likewise so circumstanced ; but we further know that it was cultivated by Parkinson, and his expressions were considered as implying that the bulbs had been sent to him from the Pyrenees by a Frenchman. The words do not very clearly refer to this plant, but the name by which he describes it implies that he thought it a native of the mountains. But if a Frenchman had found it on the Pyrenees, how is it that it has no place in the *Flora Gallica*, and that it has never been discovered wild since the days of Parkinson ? *Incomparabilis* has been found wild in France, and, I believe, in Bavaria ; and it has been a question amongst collectors whether it was generated accidentally between an *Ajax* and *Narcissus poeticus*. There can be no doubt that in every respect, except the smell, it is, in all its varieties, such a plant as might be expected to be produced by such an union. It increases abundantly by offsets, and is common in our gardens, but it has not been found to produce any seed by those who attend to the cultivation of *Narcissi*. Parkinson states that its seeds are pretty large for a *Narcissus*, but very rarely produced ; but he gives no account of its having been propagated by seed : and yet, if it had been a natural species, it might be presumed that it had been freely cultivated by seed to have obtained the three fine double varieties we possess, as well as single ones. Under these circumstances, I tried whether I could obtain seed from it by its own pollen, protecting it from the weather ; secondly, whether it would make seed by any other pollen ; thirdly, whether I could cross *Ajax* with *Narcissus poeticus*, and make the very plant. The result is, that I could obtain no seed from it by its own pollen, and that, although I had at the first one seedling *Ajax* by the pollen of *Q. incomparabilis*, the usual result has been a failure in all impregnations by it. Pollen of several other *Narcissean* plants were applied to it in vain ; but by the application of the pollen of *N. poeticus*, var. *stellaris*, one of its supposed parents, I obtained a healthy pod, containing nine large seeds ; and plants are raised from them. I obtained seed from *Ajax Pseudo-narcissus* by the same pollen, which also vegetated. I also got, with the greatest facility, seed from the same *Narcissus poeticus* by *Ajax luteus*, var. *propinquus*, and var. *maximus*, and by all the varieties of *moschatatus*, the pods being large, and the seed abundant ; but I could not fertilize it by the pollen of *Q. incomparabilis* or *odora*, though botanically nearer to it in structure. Two pots full of seedlings of *N. poeticus* by *A. albicans* and *cernuus* were unfortunately killed by too early exposure to frost in the winter of 1837, after having been forced. I have since obtained similar crosses frequently, both from the wild *pseudo-narcissus* of Yorkshire and

from the neat little Ajax minor. The result produced Haworth's *Q. incomparabilis* and aurantia and another form from the same pod, as figured in the Botanical Register; and afterwards various hybrid varieties with both pale and orange cup, like a single orange-phoenix of the gardens, and the *Queltia* concolor named by Haworth from a lost plant of Parkinson's, and his *Q. alba*; and also, from Ajax minor, varieties of smaller stature. From *incomparabilis* itself, by the pollen of *N. poeticus*, was produced a very pleasing new plant, figured as *Narcissus Spofforthia* in the Botanical Register, which, with a larger and orange cup, had the generic features of a true *Narcissus*, like *poeticus*; and it seemed very evident that another cross by the pollen of *poeticus*, or at most two, would actually produce a genuine *N. poeticus* from the descendants of Ajax Pseudo-Narcissus, and extirpate the female type. I have not had leisure and opportunity to follow up that experiment, the bulb having been planted out, and the *Narcissi* do not make seed so freely in the border as when forced and kept from strong sunshine.

The facts above recited are sufficient to establish the point, that the several varieties, single and double, of *Q. incomparabilis* were raised between *N. poeticus* and some yellow Ajax, above two hundred years ago, and that more varieties may be obtained by following the processes above stated. I apprehend that the yellow parent has been *A. Pseudo-narcissus*, var. *nobilis*, the Pseudo of Redouté, in which I have perceived a similar unpleasant smell. By the pollen of a cut flower of that *N. Spofforthia* I obtained twelve very strong seeds from *N. montanus*, taken up just before it flowered, and potted at the Fulham nursery, placed in my room in Portman Square in 1842, and deprived of its anthers; the only pod of seed *N. montanus* is recorded or known, as far as I can hear, to have ever produced. Those seeds were unfortunately mislaid in removing from London, and were never recovered. The pollen of *N. montanus*, whether it be a natural plant or not, is very fertile. I have flowered seedlings from Ajax minor by it, and very neat and pretty things they are. I have also flowered seedlings from *N. poeticus* by it, and they are remarkable, having the widely expanded limb of *poeticus*, with the drooping posture and long cup of *montanus*, in one of them a little edged with red. This is a strange circumstance. A plant, widely distinct from any other species, cultivated above two hundred years, not since found, as far as I can learn, where it was supposed to grow, or elsewhere, except in gardens, producing no seed by its own pollen usually, if ever, yet very ready to fertilize its neighbours, and to be fertilized by a cross-bred plant! If it be cross-bred I should say that *Hermione-dubia* and *N. (Ajax) candidissimus* of Redouté are its most probable parents. From Ajax Pseudo-narcissus and minor I have many crosses by *Hermione*, especially the variety called *States-general* by the Dutch; they make the genus *Diomedes* of Haworth. Pseudo by *States-general* produces a very handsome, vigorous, two-flowered, yellow *Diomedes*, with some little variety of shape and tint. I have given a figure

of one from *A. minor* in the Register, and it will serve to show how *Diomedes Macleayi* and *Sabini*, of Haworth, originated. *Sabini* produces no seed by itself, but I have had seedlings from it by *N. poeticus*, which have been rather neglected.

We must next consider *Q. odora*, of which there are ten or eleven varieties, but no person has been able to produce to me a seed from any one of them ; and though several spots in the South of Europe are pointed out as their native places, I cannot learn that any botanist has found their fruit. M. Loiseleur des Longchamps, the author of the '*Flora Gallica*,' to whom I am obliged for the urbanity with which he has replied to my inquiries concerning the French *Narcissi*, assures me that it is certainly indigenous in France ; but he admits the fact that he has never heard of its seed being found ; and, although its seed is mentioned in the Neapolitan Catalogue, Professor Tenore could give me no tidings of it.

Clusius above two hundred years ago received the variety *calathinus* from a Dutch garden, and was ignorant of its native country. Bulbs of the variety *isometra*, which I described for the first time from a specimen gathered under the chesnut trees in Madeira, have been since imported from thence, but I cannot learn that any seed of it is discoverable, and I believe it is confined to a particular spot. It is observable, that the chesnut woods in Madeira are not indigenous ; and in them, and them only, *Amaryllis Belladonna* is now found abundantly, though certainly not an original native of the island, and not observed there by Masson. It is further to be considered, that as we possess many varieties of *Q. odora*, they could not have been obtained without cultivation by seed, unless we suppose that they are all to be found in different localities equally sterile, which is almost an absurdity. How then could they have been made ? From my experience in breeding mules, I said from the first that if *Ajax luteus* could cross with the jonquil, it would produce exactly such plants, and that all the varieties might be obtained by fertilizing the latter by different varieties of *Ajax*.

These sentences are printed from a page written eight or nine years ago, and the opinion therein expressed has been since verified. Such plants have been raised both by myself and by Mr. Trevor, Alcock, near Carmarthen, and, having flowered, have shown that the Linnæan *N. odorus*, the genus *Philogyne* in all its variations, is cross-bred between *Ajax* and jonquil. Concerning the sterile *Q. orientalis* (*Schizanthus* of Haworth), I am quite satisfied that it is a cross between *Narcissus*, either *poeticus* or *albus*, and *Hermione Italica*, probably *var. præcox*. I have been able to obtain no cross from any *Narcissean* plant by the pollen of *odorus*, *orientalis*, *tenuior*, *Bazelman major* or *minor*. The pollen of the double Roman and *Soleil d'or Narcissi* of the shops is sterile from long cultivation by offsets.

I think there is a strong presumption that the whole section of large-anthered *Queltias* (*Amaryllidaceæ*), are cross-bred plants of long standing

in our gardens ; and the probability is that they were raised above two hundred years ago in a Dutch garden, either by accident, from the contiguity of the species in cultivation, or more probably by the skill of some gardener who may have possessed the secret of hybridizing them, and suffered it to die with him. It must be remembered, that wherever a cottage garden existed two or three centuries ago, the bulbs that were grown in it, if the climate is congenial to them, may continue to be reproduced ; that cultivators may even have amused themselves with planting a bulb in any coppice or pasture ; and that bulbs may be carried into the fields with manure, or dropped by accident ; and that the existence of some of these Narcissi in particular spots in France where they do not make seed, cannot be taken as proof of their being natural species and indigenous.

There is another portion of the Narcissi which labors under a like suspicion—I mean the family of *Hermione bifrons*. I am of opinion that *bifrons* and *compressa* were both raised between a yellow *Hermione* and a jonquil, and I entertain no doubt that they can be so reproduced with variation. Not having had any stock of single jonquils, and having been disappointed in the Dutch bulbs which were purchased for the experiment, but which proved to be *calathina*, I was not able to bring this to the test ; but the crosses which I have obtained between *Ajax* and *Hermione* make it certain that jonquil, which is nearer allied to *Hermione*, will mix with it. I have seedlings from *A. pseudo* by a yellow *H. brevistyla*, from *A. minor* by *papyracea*, *æquilimba*, and *italica* or *States-general*. All the breeders were forced near a month before the time of flowering, and were carefully deprived of their anthers some days before expansion by making an incision in the tube and drawing them out at bottom, so that they did not approach the stigma ; and the non-access of the natural pollen was proved by the invariable failure of all the flowers touched with the pollen of certain plants, and the success of almost all touched with that of certain others. For instance, the failure was complete with pollen from double Roman *Hermione* which seemed very dry ; of *Soleil d'or* (doubtless because the bulbs have been raised by offsets for three or four centuries) ; of the large-anthered *Queltias*, except *montana* ; of *Bazelman major* and *minor*, which I am satisfied are crosses between *Hermione brevistyla* and *Narcissus poeticus* ; of *N. gracilis* and *tenuior* ; of *Corbularia* and *Ganymedes* ; while it is remarkable that almost every *Ajax* flower touched with pollen of *Hermione*, *States-general* has seeded. The application of pollen of *Ajax luteus* or *moschatus* to *Narcissus poeticus* is almost sure of success. The constitution of the seedlings was very different. The seed of *A. pseudo-narcissus* crossed with *A. luteus* came up readily, and grew so fast and weak in the green-house in winter that it was necessary to put the pot out ; that of the same *Ajax* which was impregnated by *Hermione brevistyla* came up very slowly, much of the seed rotting, and the seedlings did not find the house too warm, and were twice as many months as the others were weeks in reaching

the same stature, and proved so delicate that, having been planted out in May, all but one of the first batch, which was much injured, rotted by the cold and wet in the autumn. One drawback is, that the seed of *Narcissi* is very apt to lie two years in the ground, unless sown immediately ; and to rot if it gets too much wet before it is ready to vegetate ; and that the snails are apt to destroy the seedlings if raised in the open border ; and that the mule seed, however good and fine, is more apt to suffer than the natural seed.

N. gracilis and *tenuior* lie under the same suspicion as the *Queltias*. Their native country cannot be shown ; their seed has not been seen ; that which I described as less round than the seed of *N. poeticus*, was from the Chelsea Garden ; but it proved to be seed of the larger and lesser jonquil, misnamed by a mistake. There is an outline in Parkinson of a plant said to be from the Pyrenees, which looks like *tenuior* ; but I very little heed this ; for if the mules were raised by the secret skill of some gardener, he would have been likely to state a false origin. I apprehend that they can be produced between jonquil and *Narcissus poeticus* or *albus*, *gracilis* from the larger *Narcissus*, *tenuior* from the diminutive pale *poeticus* which I have had from Florence ; and I have more than once had seed from *N. poeticus* by the jonquil, which would indubitably have produced *N. gracilis*, but the seedlings have been neglected and the labels mislaid. Neither *gracilis* nor *tenuior* have been known to bear seed, nor has any native locality been assigned to them. I believe them to have sprung from the larger and smaller varieties of *poeticus*. That Bazelman major and minor of the shops, and Sweet's *Hermione Cypri* are the produce of *poeticus* and a white-limbed *Hermione*, and *N. bifrons* and *compressus* of *Tazetta* and jonquil, I consider to be as certain, as if I had obtained them from seed, and I have not troubled myself to make the like.

There is ample room for further experiments in this race of plants, from which much vernal beauty for our gardens and rooms may be obtained, and even the curious little autumnal *Narcissus* and the autumnal green jonquil may be brought into action. But the great value of these experiments lies in the strong light they throw on the wide variation which the Almighty has permitted from his created type with licence to revert towards the abandoned form, and by intermixture to produce new forms, while in other races, which exhibit less diversity of form amongst the species, the variation seems fixed. There cannot be more perfect similarity of structure and habit, excepting a difference in the size of the seeds, in any two plants of different species than in *Schizanthus pinnatus* and *retusus*, and yet I have tried so many chances on both plants without success that I believe they will not intermix at all. The same observations apply precisely to *Anomatheca juncea*.

While the foregoing sentences were in the press, a curious anomaly in the strange race of plants of which I have been treating (the *Narcissi*) has come

to light, though we had some obscure notices before of such a tendency in the genus ; I mean the obliteration of its cup ; which was ingeniously compared by a friend of mine to the removal of the part of the hero from the tragedy of Hamlet. *N. deficiens*, *mih*i, from Sta. Maura, has no cup that I can distinguish without a magnifier, and the little ridge that exists is imperfect, and in some of the plants takes the form of six minute separate teeth. The cup had been dwindling away to little in the other known autumnal species, and we have an obscure notice of an eight-flowered *Narcissus obliteratus*, said to be found near Mogadore. This suggests to me so strong an illustration of the probable origin of races and their departure from one point, that I must be permitted to pursue the subject a little further. *N. deficiens* has one or two short, slender, cylindrical leaves, just like the flower-stalk, and one small white star-shaped flower with a tube, and an abortive attempt to produce the rudiment of a cup. The order contains *Narcissi* with the filaments included within a cup ; the *Paneratiform* plants, in which they are connected by the cup ; the *Amarylliform*, in which there is no cup, but often an irregular manifestation of the membrane that forms it in the shape of ring, screen, or beard, or even supernumerary anthers ; and the *Caulescent* plants, such as *Alstroemeria*. I wish to illustrate the possibility, and even probability, of their being all branched from one created type, however dissimilar at the remotest extremities of the order. First, then, I consider *N. deficiens* to be the nearest existing plant to the first *Narcissus* ; and turning to the *Paneratiform* plants, I find Cavanilles' *Paneratium humile* (*Tapeinanthus*, Herbert corrected to *Tapeinægle*, the former name having been pre-occupied, but perhaps referable to genus *Lapidra*), in size, bulb, foliage, stalk, and flower nearly similar to *N. deficiens*, excepting the yellow color of its limb, and its sometimes bearing two flowers on the stalk, like *N. obsoletus*. Its cup is so deficient, that in the one dry specimen I have seen I could not perceive it without a lens, and it was merely a minute exhibition of a thread of connecting membrane. The most conspicuous difference is the prolongation of the filaments, and the want of a tube. Cavanilles' plate is very inaccurate. The specimen had a one-flowered scape five inches long, peduncle above one-fourth, spathe eleven-sixteenths of an inch, germen short, perianth seven-sixteenths long, segments about one-tenth wide, cup scarcely anything but a manifestation of the membrane visible with a magnifier. Here then we have what we may suppose to be nearly the form of the first attempt to produce the *Paneratiform* plant. The abbreviation of the tube from many inches to a fraction occurs in the genus *Hippeastrum*. But I have another autumnal flower at this moment just appearing, *Carpolyza spiralis*,* of the *Amaryllidiform* section ; and in what does it differ from *N. deficiens* ? Bulb, leaf (except its not being erect), scape, spathe, season, size, and shape of the flower similar, and the color nearly so ; bearing sometimes three flowers ; but it has the fleshy seeds of its division, and

it has no manifestation of the membrane. Here then we have what we may take as nearly the first type of *Amaryllis*, *Crinum*, and the whole division to which they belong. Approach these three, and compare them ; and however widely they have departed from each other at the extremities of each division, who will venture to say that they could not have proceeded from one type ?—or that *Carpolyza* without the membrane may not be the very root and foundation of the order ? Is the breadth of a hair in the position of a thread of membrane either between or behind the filaments, or its total absence requiring keen sight or a lens to discover it, a variation impossible in the course of generations since the creation of vegetables before the sun shone upon the earth ? Is it a feature of difference as conspicuous as those which daily occur amongst seminal varieties ? And does it not derive its importance (for I do not underrate its importance) merely from its having become in all its further development a fixed character and the badge of a peculiar family ? It must be remembered, that even amongst the *Pancreatiform* plants, *Urceolina* has even less rudiment of a cup than *N. deficiens*, and that in *Pentlandia*, which in every other respect is a perfect *Stenomesson*, with which it is perhaps capable of breeding, there is no vestige of the membrane which forms a cup. Then turn to *Alstrœmeria*, and look at *Alstrœmeria pygmæa*, *Herb. Am.*, pl. 8, and see something like the first attempt to produce that race, a solitary pale-yellow flower on a short stalk, with a few narrow leaves at its base, and see how near it comes to the *Tapeinægle humilis* ; having, however, a palmated tuber, and therewith the disposition to a leaf-bearing stalk—a variation occurring in some genera amongst plants of which the flowers are conformable, as in the group of *Sisyrinchium*. The round turnip has this very year degenerated into a bunch of keys in my fields, in consequence of the state of the atmosphere, as I know to my cost ; and since the change of weather some turnips are beginning to form a round root on the top of the bunch. Here I see, to my cost, how the condition of earth, air, and water can affect the conformation of a root ; and I learn what the changes that have taken place since the great era of the creation of vegetables may have done in that respect. I should take *Zephyranthes minima*, and *Gracilis*, *Carpolyza*, *Hessea*, and *Acis*, to be nearest to the created type of *Amaryllidaceæ*.—*Journal of the Horticultural Society of London*, Vol. ii, part 1.

Experience in the Transmission of Living Plants to and from Distant Countries by Sea. By MR. FORTUNE, Curator of the Botanic Garden of the Society of the Apothecaries at Chelsea.

Having been engaged by the Horticultural Society of London to proceed to China for the purpose of examining the Horticulture and Botany of that country, and of sending home such vegetable productions as might be useful or ornamental in England, the Council deemed it an excellent opportunity

for sending out at the same time a collection of living plants and seeds, with the view of ascertaining precisely the effects produced upon such things during a long sea voyage, as well as of introducing to China some of the best flowers, fruits, and vegetables which are cultivated in Europe. For this purpose they ordered some glazed cases to be prepared, and filled with such kinds of fruit-trees and ornamental plants as were likely to succeed well in the climate of China, and be of use both to the Chinese and to the foreign residents. They were made fast on the poop of the vessel, and we sailed from England on the 1st of March, 1843. The weather during the early part of the voyage was cold, dull, and wet, and the plants grew very little until we reached the latitude of Madeira, which we saw on the 13th of the month. The thermometer averaged 62° Fahr. at this time in the shade, and the plants feeling the effects of the sudden change of temperature began to grow with great rapidity, completely filling the cases in a few days with young shoots and leaves. This took place before we reached the equator. The vines, peach-trees, and figs seemed quite at home; the roses also grew fast and began to blossom, but were evidently in an atmosphere which was too hot and close for their constitution, and in a short time their leaves began to suffer from pressure against the damp glass in the same manner as we frequently see plants in crowded hot-houses in England.

About this period—that is, when we were in the vicinity of the equator—the thermometer averaged 77° in the shade, and was frequently higher in the night than during the day. From the condition of the plants at this stage of the voyage, it was evident that a most important point in the preparation of cases is always to select specimens which are strong, healthy, and well established; weak plants, in many instances, are sure to perish, because the stronger kinds overgrow them, keeping them from the light and air, and preventing them from forming stems and leaves for their support.

We passed the longitude of the Cape of Good Hope in the beginning of May, but in order to have the advantage of westerly winds we kept well south—in lat. 38°—where the thermometer ranged from 55° to 65° Fahr. This change was evidently a most trying one for the plants, which, after having grown rapidly when sailing through warmer climates, and having filled the cases with weak, half-ripened wood, were now suddenly checked by dull weather and a temperature which was comparatively low. Mildew and other fungi now attacked them, and most of the leaves which were in contact with the glass were rotted by the damp.

It was curious to remark the similar effects which were produced upon animals and plants by this change of temperature; both suffered more from comparative than from actual cold. A few weeks before this, the plants began to grow most rapidly in a temperature about the same as that in which they were now suffering from cold; in fact, they grew considerably then, in a temperature several degrees lower. The very same effects were produced

upon my own feelings, as well as upon those of the other passengers in the ship. We felt the heat much in lat. 33° or 34° N., with a temperature of 58° and 60° , and were then putting on our thin white clothing ; while with the same warmth on the south side of the line we felt cold, and were obliged to resume our thick, warm dresses.

Having kept in the same degree of latitude all along from the Cape until we reached the Islands of Amsterdam and St. Paul's, in the Indian Ocean, we then stood northerly, in the direction of Java Head. The temperature, of course, gradually increased as we sailed northwards, but the excitability of the plants was, in a great measure, gone, and even when we reached the Straits of Sunda, where, owing to the proximity of land, it was much warmer than it had been under the line in the Atlantic Ocean, still they grew again in a slow and languid manner, and the shoots were weak. It is these rapid changes from summer to winter, and from winter to summer, which destroys so many plants in a long voyage round the Cape, to or from India or China.

When we reached Hong-Kong I found that most of the plants were alive, although some of them were in a very exhausted state. Some olive-trees which I took out were as healthy and green as the day we started ; vines, pears, and figs also stood the voyage remarkably well. The soil, although it had received no water for four months, was nearly as moist as when we left England, which proved the closeness of the cases.

Having described what actually takes place during a long sea voyage, I shall now proceed to give some instructions relating to cases, packing, shipping, and general management, which, I trust, will be useful to those interested in such matters.

GLAZED CASES.—"Ward's Cases," or air-tight cases, as they are commonly called, are so well known in all parts of the world, that a minute description of them here is unnecessary. They are not, strictly speaking, air-tight, but they are so close that the moisture cannot escape, and therefore, if the soil is well watered before the case is closed, the moisture is retained in sufficient quantity to support plants during a voyage to or from the most distant parts of the world. When the sun shines, evaporation goes on in the usual way, but the vapour finding no outlet condenses on the glass and wood of the cases, as well as upon the leaves of the plant, and in the evening again falls down like dew upon the soil. In this manner the vapour goes on forming and condensing, according to the heat of the weather during the voyage, without much actual loss, providing the cases are tightly made.

After this explanation, any one will be able to see that it is of the greatest importance, to have the cases made of well-seasoned wood, which is not liable to split or open at the joints when exposed to the hot sun of the tropics. If this happens, the plants will either perish from drought, or probably be admitted, which is equally fatal to vegetable life.

Another defect in the construction of many of these cases is the shortness of their feet. The bottom of the case should always be at least six inches raised from the deck of the vessel. Washing decks is the first part of the sailor's business every morning at sea, and they are not generally very particular as to where they throw the water. If the feet of the plant-case are shorter than six inches, there will not be sufficient room for the sailors to dash the water below it, and consequently both the bottom and sides will stand the chance of being washed every morning as regularly as the decks. In the course of a four or five months' voyage, the salt water is certain to find its way into the soil, which it then saturates, and destroys the roots of the plant. I have no doubt that this is one of the reasons why plants generally arrive in such bad condition from India and other parts of the world, for I have frequently seen the soil of such cases in a complete puddle when they come to hand in England.

PLANTS, SOIL, &c.—I have already noticed the great importance of choosing strong, healthy plants, which are not liable to be overgrown or to damp off during the voyage. I found that grafted plants were also more liable to suffer than others, as one or two of my young scions died, while the stocks remained healthy enough.

The soil of the cases should be at least nine or ten inches in depth. After the plants are put in, each case should be placed perfectly level, and liberally supplied with water. It is much better if this can be done ten days or a fortnight before the plants are to be sent off, so that they may be well established in their new quarters. During this time they can have frequent waterings, and then, when the soil has filled up all the crevices in the cases and become firm, it may be fastened down with cross bars of wood. A little moss, where it can be obtained, is an excellent thing to sprinkle on the surface, as it both helps to keep the earth down, and at the same time prevents evaporation from going on too rapidly.

This mode of packing applies to shrubs and trees; orchids, or air plants, require different treatment. As the latter do not draw much nourishment from the soil, there is no occasion to have so much of it in the cases; indeed, a large body of damp soil is very apt to rot the plants. Two or three inches is quite sufficient. As these plants are generally found growing upon trees, the best way is to cut the portion of the branch on which the plant grows, and send it home with the plant upon it. In the majority of cases it is a bad plan to pull the roots off the wood, if the plants are to be sent in glazed cases and exposed to a sea voyage for five or six months. When I despatched some cases filled with *Phalænopsis* from Manilla, I had them made with only one glazed side, the other was wood. After packing the bottom of the cases full of plants I nailed a great number to the wooden side, and from the number which arrived in good order in this country the plan must have answered the purpose. It is well known that many of these air plants require

so little nourishment from the soil, that they may be sent home in common packing cases if the voyage does not occupy more than six weeks or even two months, such as from the West Indies or South America. The above remarks, with regard to air plants, therefore, only apply to long voyages, such as from India or China to this country.

SHIPS AND SHIPPING PLANTS.—When the vessel is about to sail, the cases should be closed firmly, and the joints must be made perfectly tight. Narrow strips of canvas dipped in a boiling mixture of tar and pitch, and put on the outside of the joints, answer the purpose admirably, and should always be used where there is any difficulty in making the joints close.

Large vessels with poops are the best for plants, and should always be preferred where there is any choice, as their deck is higher and consequently less liable to be washed by the sea. The poop, either in small or large ships, is the best place for the cases to be placed—in small vessels they should either be put there or not sent at all. The main or mizen top is sometimes recommended, but most captains object to have such heavy articles placed so high above the decks.

In 1841 or 1842 the Horticultural Society received a case of plants by the 'Emu,' from Van Diemen's Land, the whole of which were dead when they reached this country. As I happened, in 1843, to go out to China by the same vessel, I made some inquiries of one of the officers regarding the treatment this case had received on board during the passage home. He candidly told me that they had considered it too much in the way when on the poop, and had sent it forward near the bows. When, therefore, the vessel was "on a wind," or had a heavy head sea to contend with, she shipped a great quantity of water over the bows, and, of course, deluged the poor plants. This at once accounted for the bad order in which the case had been received. I should therefore recommend botanical collectors, and those individuals who are in the habit of sending home cases of plants from the far distant East to their friends in Europe, to obtain a promise from the captain that the cases shall remain upon the poop of the vessel during the whole of the voyage. If they are sent forward, or even placed upon the quarter-deck, the contents are sure to be destroyed. It is also the best way to ship the cases in the usual business manner, taking a bill of lading for the same, with the freight payable in England, or in any other place to which the ship may be bound.

Unless there is some one on board who understands the cultivation of plants, the cases should never be opened from the time they are shipped until they arrive at their destination. The only directions I was in the habit of giving when I took the plants on board, were the following:—"Do not move them from the poop; never allow them to be opened; should any accident happen to the glass repair it immediately, either with glass, or, where that cannot be had, a piece of thin board will answer the purpose; in stormy weather, when there is any probability of spray coming over the

poop, throw an old sail over the cases ; and, lastly, *never allow the sailors to throw a drop of water over them when they are washing decks in the morning.*" These directions are short, easily understood, and easily acted upon.

TREATMENT DURING THE VOYAGE.—When the botanical collector returns with his plants, or when there is any one on board of the ship who understands their management, the cases may be opened and the plants examined from time to time with the most beneficial results. In order that those who are going out or returning from the East may understand how this is best done, I shall detail, shortly, my own practice during the voyage home, and its results.

Eighteen cases were packed in the manner I have already recommended, and taken on board of the 'John Cooper,' then at anchor in the Bay of Hong-Kong. As it was in the end of the year, the monsoon was fair down the China Sea, and we reached the Island of Java in eleven days. After passing the Straits of Sunda we had variable winds for a week or ten days, and then got into the south-east trades. In these latitudes the weather is generally settled and fine, the sea is smooth, and the vessel is wafted gently onward in her course towards the Cape of Good Hope. In ordinary circumstances, therefore, it is perfectly safe to open the cases frequently during this part of the voyage. Those under my care at this time were made with sliding-doors at each end, so that I could give air and get my hand in without unscrewing the sides. These slides were drawn out almost every day in the morning *after decks were washed*, and on very fine days the side-sash of each case was unscrewed and the plants fully exposed. At these times all the dead or damping leaves were removed and the surface of the soil dressed and cleaned. I always made it a rule never to leave any of them open at night, however fine the night might appear to be.

This mode of treatment was carried on until we began to get near to Madagascar. As bad weather is generally experienced off this island, I made all the cases as tight as possible with putty, and never opened them again until we got round the Cape. After the "Cape of Storms" is passed, the mariner generally gets again into fine weather, and with a fair south-east trade wind runs direct for St. Helena. Knowing that I would be able to procure a supply of fresh water there, I exposed the plants as much as possible every day, in order that all the dampness might be removed, and that the young wood which was then formed on many of the plants might be well hardened. When we anchored at St. Helena I took care to give the soil as much fresh water as it could take in, and then screwed the sashes down again. The weather continued fine and the winds fair until we reached the equator. During this time the end slides were generally open every day. When near the equator we again got into variable winds, having run out of the "trades," and were frequently deluged with heavy rains. At these

times I was in the habit of opening the sashes and allowing the plants to receive a refreshing shower, which did them a great deal of good. In circumstances of this kind, however, great care should be taken that the water does not come down out of some of the sails which have been exposed to the salt spray of the ocean, as it would then be impregnated with salt, and would probably injure or destroy the plants. I notice this more particularly, as an accident of the kind nearly happened to myself.

After coming through the "variables," we got what are called the north-east trade winds, and steered for the Western Islands. As the weather was now bad, and the vessel "close-hauled," that is, sailing very near the wind, we often had a considerable quantity of spray coming over the deck. Before coming into this weather I took care to have the cases again perfectly closed; the end slides now had often to remain closely shut down, not only on account of the spray, but also on account of the saltiness of the air, which would, doubtless, have been very deleterious. After having three or four weeks of this weather, we got at last into smooth water in the English channel, where, as the weather was fine, I again opened the cases and found them in excellent order. No detention taking place at the Docks, the cases were immediately conveyed to the garden of the Society at Chiswick. The following numbers will show the results of this shipment:—

Number of Plants put into the cases in China	...	...	250
„ reported in good condition when landed	...	...	215
„ which died during the voyage	...	...	35

In a communication from Mr. Livingstone of Macao, read to the society in 1819, and published in the 3rd Vol. of Transactions, it is stated that, at that time only one plant in a thousand survives the voyage from China to England, and supposing on an average that plants purchased in Canton, including their chests and other necessary charges, cost 6s. 8d. each, consequently each surviving plant must have been introduced at the enormous expense of upwards of 300l.; the results which I have given above will show, however, that we have made some improvements in the introduction of Chinese plants since the days of Mr. Livingstone.—*Ibid*, Vol. ii, part II.

Giutta Percha. By THOMAS OXLEY, Esq., A. B., Senior Surgeon of the Settlement of Prince of Wales' Island, Singapore and Malacca.

Although the trees yielding this substance abound in our indigenous forests, it is only four years since it was discovered by Europeans. The first notice taken of it appears to have been by Dr. Montgomerie in a letter to the Bengal Medical Board in the beginning of 1843, wherein he commends the substance as likely to prove useful for some surgical purposes, and supposes it to belong to the fig tribe. In April 1843 the substance was taken to Europe by Dr.

D'Almeida who presented it to the Royal Society of Arts, London, but it did not at first attract much attention, as the Society simply acknowledged the receipt of the gift; whereas shortly after they thought proper to award a gold medal to Dr. W. Montgomerie for a similar service. Now, as the discovery of both these gentlemen rested pretty much upon the same foundation:—the accidental falling in with it in the hands of some Malays who had found out its greatest peculiarity,—and, availing themselves thereof, manufactured it into whips which were brought into town for sale: there does not appear any plausible reason for the passing over the first and rewarding the second. Both gentlemen are highly to be commended for endeavouring to introduce to public notice, a substance which has proved so useful and interesting. The Gutta Percha having of late attracted much attention, and as yet but little being known or published about it,* I would now propose to supply, to the best of my ability, this desideratum, and give a description of the tree, its product and uses, so far as it has been made available for domestic and other purposes, in the place of its origin.

The Gutta Percha tree, or Gutta Tuban, as it ought more properly to be called,—the Percha producing a spurious article,—belongs to the natural family Sapotææ, but differs so much from all described genera, having alliance with both Achras and Basia, but differing in some essentials from both, that I am disposed to think it is entitled to rank as a new genus. I shall therefore endeavour to give its general character, leaving the honor of naming it to some more competent botanist, especially as I have not quite satisfied myself regarding the stamens from want of specimens for observations.

The tree is of large size, from eighty to ninety feet in height, and two to three feet in diameter. Its general appearance resembles the genus *Durio*, or well known Doorian, so much so, as to strike the most superficial observer. The under-surface of the leaf, however, is of a more reddish and decided brown than in the *Durio*, and the shape is somewhat different.

The flowers are axillary, from one to three in the axils, supported on short curved pedicles, and numerous along the extremities of the branches.

Calyx, inferior, persistent, coriaceous, of a brown color, divided into six sepals which are arranged in double series.

Corolla, monopetalous hypogæous, divided like the calyx into six acuminate segments.

Stamens, inserted into throat of the corolla, in a single series, variable in number, but, to the best of my observation, the normal number is twelve; most generally all fertile, anthers supported on slender bent filaments, opening by two lateral pores.

Ovary, superior, terminated by a long simple style, six-celled, each cell containing one seed.

* Several interesting papers, original and selected, regarding Gutta Percha, have been published in previous numbers of the Journal of the Agri-Horticultural Society of India.—Eps.

Leaves about four inches in length, perfect, entire, of a coriaceous consistence, alternate, obovate-lanceolate, upper surface of a pale green, under-surface covered with close, short, reddish-brown hairs. Midrib projects a little, forming a small process or beak.

Every exertion of myself and several others having failed in procuring a specimen of the fruit of the Gutta, I regret being compelled to omit the description of it in the present instant, but hope to rectify this omission in some future number of the Journal. It is quite extraordinary how difficult it is to obtain specimens of either the flower or fruit of this tree, and this is probably the reason of its not having been earlier recognized and described by some of the many botanists who have visited these parts.

Only a short time ago the Tuban tree was tolerably abundant on the Island of Singapore, but already all the large timber has been felled, and few, if any, other than small plants are now to be found. The range of its growth, however, appears to be considerable; it being found all up the Malayan peninsula as far as Penang, where I have ascertained it to be abundant; although as yet the inhabitants do not seem to be aware of the fact: several of the mercantile houses there, having sent down orders to Singapore for supplies of the article, when they have the means of supply close at hand.

The tree is also found in Borneo, and I have little doubt is to be found in most of the islands adjacent.

The localities it particularly likes are the alluvial tracts along the foot of hills, where it flourishes luxuriantly, forming, in many spots, the principal portion of the jungle. But notwithstanding the indigenous character of the tree, its apparent abundance, and wide spread diffusion, the Gutta will soon become a very scarce article, if some more provident means be not adopted in its collection than that at present in use by the Malays and Chinese.

The mode in which the natives obtain the Gutta is by cutting down the trees of full growth and ringing the bark at distances of about twelve to eighteen inches apart, and placing a cocoanut shell, spathe of a palm, or such like receptacle, under the fallen trunk to receive the milky sap that immediately exudes upon every fresh incision. This sap is collected in bamboos, taken to their houses, and boiled in order to drive off the watery particles and inspissate it to the consistence it finally assumes. Although the process of boiling appears necessary when the Gutta is collected in large quantity; if a tree be freely wounded, a small quantity allowed to exude, and it be collected and moulded in the hand, it will consolidate perfectly in a few minutes and have all the appearance of the prepared article.

When it is quite pure the color is of a greyish-white, but as brought to market it is more ordinarily found of a reddish hue, arising from chips of bark that fall into the sap in the act of making the incisions, and which yield their color to it. Besides these accidental chips there is a great deal of intentional adulteration by sawdust and other materials. Some specimens

I have lately seen brought to market, could not have contained much less than $\frac{1}{4}$ th of impurities ; and even in the purest specimens I could obtain for surgical purposes, one pound of the substance yielded, on being cleaned, one ounce of impurities. Fortunately, it is neither difficult to detect or clean the Gutta of foreign matter ; it being only necessary to boil it in water, until well softened, roll out the substance into thin sheets, and then pick out all impurities, which is easily done as the Gutta does not adhere to any thing, and all foreign matter is merely entangled in its fibres, not incorporated in its substance. The quantity of solid Gutta obtained from each tree varies from five to twenty catties, so that, taking the average at 10 catties, which is a tolerably liberal one, it will require the destruction of 10 trees to produce one picul. Now the quantity exported from Singapore to Great Britain and the Continent, from 1st January 1845 to the present date, amounts to 6,918 piculs, to obtain which, sixty-nine thousand, one hundred and eighty trees must have been sacrificed. How much better would it therefore be to adopt the method of tapping the tree practised by the Burmese in obtaining the Caoutchouc from the *Ficus elastica*, (viz., to make oblique incisions in the bark, placing bamboos to receive the sap which runs out freely,) than to kill the goose in the manner they are at present doing. True they would not at first get so much from a single tree, but the ultimate gain would be incalculable, particularly as the tree appears to be one of slow growth, by no means so rapid as the *Ficus elastica*. I should not be surprised, if the demand increases, and the present method of extermination be persisted in, to find a sudden cessation of the supply.

Properties of the Gutta.

This substance when fresh and pure is, as already mentioned, of a dirty white color, and of a greasy feel, with a peculiar leathery smell. It is not affected by boiling alcohol, but dissolves readily in boiling spirits of turpentine, also in *Naphtha* and coal tar. A good cement for luting bottles and other purposes is formed by boiling together equal parts of Gutta, coal tar and resin. I am indebted for this hint to Mr. Little, Surgeon, and the above were his proportions. I have, however found it necessary to put two parts of the Gutta, that is, one-half instead of one-third to enable the cement to stand the heat of this climate. When required for use it can always be made plastic by putting the pot containing it over the fire for a few minutes. The Gutta itself is highly inflammable, a strip cut off takes light, and burns with a bright flame, emitting sparks, and dropping a black residuum in the manner of sealing wax, which in its combustion it very much resembles. But the great peculiarity of this substance, and that which makes it so eminently useful for many purposes, is the effect of boiling water upon it. When immersed for a few minutes in water above 150 degrees of Fahr. it becomes soft and plastic, so as to be capable of being moulded to any

required shape or form, which it retains upon cooling. If a strip of it be cut off and plunged into boiling water, it contracts in size both in length and breadth. This is a very anomalous and remarkable phenomenon, apparently opposed to all the laws of heat.

It is this plasticity when plunged into boiling water that has allowed of its being applied to so many useful purposes, and which first induced some Malays to fabricate it into whips which were brought into town and led to its farther notice. The natives have subsequently extended their manufactures to buckets, basins and jugs, shoes, traces, vessels for cooling wine, and several other domestic uses; but the number of patents lately taken out for the manufacture of the article in England proves how much attention it has already attracted, and how extensively useful it is likely to become. Of all the purposes, however, to which it may be adapted none is so valuable as its applicability to the practice of surgery. Here it becomes one of the most useful auxiliaries to that branch of the healing art, which of all is the least conjectural. Its easy plasticity and power of retaining any shape given to it when cool, at once pointed it out as suitable for the manufacture of bougies, and accordingly my predecessor, Dr. W. Montgomerie, availed himself of this, made several of the above instruments, and recommended the use of it to the Bengal Medical Board.* But, like many other good hints, for want of sufficient enquiry, I fear it was disregarded. The practice, however, has been continued by me, and I find many advantages in the use of this substance. It also answers very well for the tubes of syringes which are always getting out of order in this country when made of Caoutchouc. But my late experiments have given it a much higher value, and proved it the best and easiest application ever yet discovered in the management of fractures, combining ease and comfort to the patient, and very much lessening the trouble of the Surgeon. When I think of the farrago of bandages and splints got rid of, the lightness and simplicity of the application, the Gutta would be no trifling boon to mankind were it to be used solely for this and no other purpose. The injuries coming under my observation wherein I have tested its utility have, as yet, only been two compound fractures of the leg, and one of the jaw. But so admirably has it not only answered, but exceeded, my expectations, that I should think myself culpable in not giving the facts early publicity. Its utility in fracture of the lower jaw must at once strike any Surgeon. So well does it mould itself to every sinuosity, that it is more like giving the patient a new bone than a mere support. A man lately brought into Hospital, who had his lower jaw broken by the kick of a horse, and which was so severe as to cause hemorrhage from the ears, smashing the bone into several fragments, was able to eat and speak in three days after the accident, and felt so well with

* Dr. Montgomerie's letter on the subject will be found in Vol. II. of the Journal of the Agri-Horticultural Society of India, published in 1843.—Eds.

his Gutta splint that he insisted upon leaving the Hospital within ten days. My mode of applying this substance to fractures of the leg is as follows :

The Gutta having been previously rolled out into sheets of convenient size, and about one-fourth of an inch in thickness, is thus kept ready for use. When required, a piece of the necessary length and breadth is plunged into a tub of boiling water. The limb of the patient is then gently raised by assistants, making extension in the usual manner. The Surgeon, having ascertained that the broken bone is in its place, takes the sheet of Gutta out of the hot water, and allows it to cool for a couple of minutes. It is still soft and pliable as wash leather. Place it whilst in this state under the limb, and gently lower the latter down on it. The Gutta is then to be brought round and moulded carefully to the whole of the back and sides of the leg, bringing the edges close together, but not uniting them. If there be any superfluous substance, it can be cut off with a scissor, leaving an open slit down the front of the leg. You have now the leg in a comfortable, soft, and smooth case, which, in ten minutes, will be stiff enough to retain any shape the Surgeon may have given it, and which will also retain the bone in situ. Place the leg so done up on a double inclined plane, and secure it thereto by passing three of the common loop bandages around the whole,—that is, one at the top, one in the middle, and one at the lower end. Let the foot be supported by a foot board, and a case of Gutta put over the dorsum of the foot, to bear off the pressure of the small bandage generally used to secure it to the board. Having done this, the Surgeon need not cause his patient another twinge of pain until he thinks he can use the leg, or he deems the bone sufficiently united to bear the weight of his patient. If it be a compound fracture ; it will only be necessary to untie the loop bandages, separate the edges of the Gutta splint to the required distance, wash and cleanse the limb without shifting any thing except the dressings, and having done so, shut it up again. The most perfect cleanliness can be maintained, as the Gutta is not affected by any amount of ablution ; neither is it soiled or rendered offensive by any discharge, all which washes off as easily from the Gutta case as from oil cloth. I have had a patient where the tibia protruded through the integuments fully two inches, walking about in six weeks from the injury, with a leg as straight and well formed as ever it had been. It is quite obvious therefore that if it answers so well for compound, it will answer equally, if not better, for simple fractures ; and that any broken bone capable of receiving mechanical support can be supported by the Gutta better than by any other contrivance. For it combines lightness and smoothness, durability and a capability of adjustment, not possessed by any other known substance. All new experiments have to run the gauntlet of opposition, and I do not suppose that these recommendations will prove an exception to the rule. But all I ask of any Surgeon is to try the experiment ere he argues on its propriety, and I feel fully convinced, that all other splints and bandages will be

consigned to the tomb of the Capulets. There are some other uses for which I have tried this substance, viz., as capsules for the transmission of the vaccine virus, which ought to keep well when thus protected, for it is most perfectly and hermetically sealed. But I have not had sufficient experience in this mode of using it to pronounce decidedly on its merits. I am at present trying the effects of it on ulcers, by enclosing the ulcerated limb in a case of Gutta so as to exclude all atmospheric air, and, so far, the experiment promises success.

Since writing the foregoing observations I have had an official intimation from Penang of the vaccine virus transmitted in the Gutta capsules having been received in good order, and of its having succeeded most satisfactorily. I have also opened a capsule containing a vaccine crust that had been kept here for one month, and it also seems to have lost none of its efficacy as the case inoculated has taken. This will appear the more striking when it is recollected that to preserve the vaccine virus hitherto in Singapore even for a few days has been almost impossible,—that this Settlement, notwithstanding every exertion on the part of both private and public practitioners, has been without the benefit of this important prophylactic for an interval sometimes of two years,—and that, at all times, the obtaining and transmitting this desirable remedy has been a cause of trouble and difficulty to all the medical officers I have ever met with in the Straits.

I observe in the *Mechanic's Magazine* for March 1847, a notice of several patents taken out for the working of this article by Mr. Charles Hancock, in which an elaborate process is described for cleaning the Gutta, as also mention of its having a disagreeable acid smell. The Gutta when pure is certainly slightly acid, that is, it will cause a very slight effervescence when put into a solution of soda, but is unaffected by liquor potassa. The smell although peculiar is neither strong nor unpleasant, so that the article experimented upon must have been exceedingly impure, and, possibly, derived a large proportion of its acidity from the admixture and fermentation of other vegetable substances. Again, it appears to me that, if the Gutta be pure, the very elaborate process described as being necessary for cleaning it, is superfluous. The Gutta can be obtained here in a perfectly pure state by simply boiling it in hot water until well softened, and then rolling it out into thin sheets, when, as I have before said, all foreign matter can be easily removed. I would recommend that the manufacturers at home should offer a higher price for the article if previously strained through cloth at the time of being collected, when they will receive the Gutta in a state that will save them a vast deal more in trouble and expense than the trifling addition necessary to the original prime cost.—*Journal of the Indian Archipelago*, No. I. July, 1847.

Monthly Proceedings of the Society.

(Wednesday, the 13th January, 1847.)

William Storm, Esq., Senior Member present, in the chair.

The minutes of the last meeting were read and confirmed, and the gentlemen then proposed were duly elected Members of the Society ; viz :—

Messrs. Francis Bailey, Robert Fergusson Ross, and W. H. Parish.

Candidates for Election.

The names of the following gentlemen were submitted as candidates for election at the next general meeting :—

William Duff, Esq., Singahsur Factory, Purneah,—proposed by Mr. S. G. T. Heatley ;

Lieut. James Young, Artillery, Dum-Dum,—proposed by Capt. F. C. Burnett ;

J. S. Dumergue, Esq., Civil Service,—proposed by Captain J. A. Currie ;

E. F. Lautour, Esq., Civil Service, Gya,—proposed by Dr. J. Denham ;

A. G. Wilson, Esq., Deputy Magistrate, Gya,—proposed by Dr. J. Denham ;

Alfred Turner, Esq., of the firm of Messrs. Birley, Corrie and Co.,—proposed by Mr. W. Haworth.

The above nominations were seconded by the Secretary.

Presentations to Library.

1. Calcutta Journal of Natural History, No. 27. *Presented by Dr. McClelland.*

2. Catalogue of the Calcutta Public Library. *Presented by the Curators.*

3. Journal of the Asiatic Society of Bengal, No. 171. * *Presented by the Society.*

Presentations to Garden and Museum.

1. A small assortment of seeds from Norfolk Island. *Presented by Capt. Livesay, of the " China."*

2. A few plants of *Jatropha panduræfolia*. *Presented by G. Wood, Esq.*

3. Two large specimens of Tibetan wool. *Presented by B. H. Hodgson, Esq.*

The papers and drawings accompanying these specimens were referred to the Committee of Papers for publication in the Journal.

4. A cake of a blue dye, made from what he believes to be a species of *Ruellia*, which grows plentifully in the forests round Gowhatti. *Presented by Major Jenkins.*

Major Jenkins adds, that this dye is commonly used by the hill tribes of Assam, and the color is very intense and permanent.

The Secretary brought to the notice of the meeting another specimen of this dye in the Society's Museum, which had been also presented by Major Jenkins in 1835, and to which reference is made in the second volume of the Transactions, page 219, where it is described as the produce of *Ruellia carnosa*. He further directed attention to the following extract from a "Journal of a visit to the Mishmee hills in Assam," by the late Mr. Griffith, (Journal Asiatic Society for 1837, page 326) which probably has reference to the same dye ;—"at this village [Palampaw] my attention was first directed to a very valuable native dye, the *Rom* of the Assamese ; with this dye, all the deep blue cloths so much used by the Kampteas and Singphoos, are prepared. What is more curious, it belongs to a family (*Acanthacea*), the constituents of which are generally devoid of all valuable properties—it is a species of *Ruellia*, and is a plant highly worthy of attention."

5. A sample of coffee, produced at Gola factory, Burdwan. *Presented by T. J. Atkinson, Esq.*

The following is an extract of a letter which accompanied this sample :—"I have the pleasure of forwarding by to-day's dawk banghy a small quantity of coffee, the growth of which is rather interesting. In 1796 Mr. Bateman purchased this factory, and having secured a large piece of ground, had it all planted out with coffee. His old gomastah assured me that it throve beautifully, though in 1801, when Mr. B. left, he had not reaped the fruits of his labors. What became of Mr. B. no one knows, but this factory was deserted for several years, during which a severe inundation of the river covered the plants with sand—and the land itself (now not of much value) being claimed by several talookdars, was allowed to lay waste, and got overgrown with jungle, &c. till 1838, when I came here, and with some difficulty got a pottah of the land to sow indigo. In clearing it away, I discovered this coffee plant, a poor stunted thing, with some dozen stems, all their heads being eaten up by bullocks. It was then I made the enquiry and got the above statement, upon which I think we can depend. This is the first year that the plant has produced, and I have sent you the whole harvest, about half a pound I should think. It is about 7 feet high, and a large thick bush, apparently in good health. I should like very much to know what is thought of this coffee."

The coffee was considered by the members present to be of tolerable fair quality.

6. A piece of cloth made by the Allipore prisoners from the fibre of the aloe plant, grown round the Insane Hospital. *Presented by F. P. Strong, Esq.*

7. Six maunds of oil, the produce of *Bassia latifolia*, (*Mowah*) from the Palamow jungles. Presented by C. B. Taylor, Esq.

Mr. Taylor having proved the capability of this oil for being converted into candles and soap, as communicated in former letters (Journal Vol. iv. p. 211, and Vol. v. p. 81), sends this large quantity to enable the Society to have it fairly tested in England. It was accordingly agreed to transmit portions to the E. I. and China Association, the London Society of Arts, and to Professor Royle, for the purpose of being transferred to any of the manufacturers of oil, who will engage to give it a fair trial and send the Society specimens of candles and soap made from it. The best thanks of the Society were given to Mr. Taylor for his zealous attempts towards developing the resources of the district of which he is a resident.

8. Two maunds of *Samah* (*Panicum frumentaceum*). Presented by C. B. Taylor, Esq.

In his letter advising the despatch of this grain, Mr. Taylor offers the following observations :

" This *Samah*, a species of millet, I believe to be a very valuable, as it is most assuredly a very cheap grain. It sells up here, (Palamow) at the present season, at 3½ bazar maunds for a rupee ; it is sown at the commencement of the rains, and its cultivation is attended with very little expence ; the grain is much cheaper, and far more suitable for human food than Indian corn, which is very indigestible : the *Samah*, on the contrary, being light and easy of digestion ; it makes very palatable puddings, which children appear more partial to than those made of rice, to which grain, when boiled, it bears a striking resemblance, both as to taste and in appearance ; it is made into a pudding with eggs, butter, and sugar, the same as rice ; to boil it, take about one pound, and put it into a vessel over the fire containing boiling water, in which let it remain for 3. minutes ; dry it after pouring off the water ; this I find boils it well.

I should think the *Samah* would prove a more acceptable food to the starving population in Ireland than Indian corn. I have also sent about 25 pounds of the husked grain, that you may try it yourself, and have some to distribute among any of the members that wish to taste it ; it looses about half its weight in the process of husking, which operation is performed with the *dankes*, the machine which the natives use for pounding *sorkee*, and cleaning rice."

Annual Reports.

A summary of the principal objects which have engaged the attention of the Society during the past year was submitted : also a report from the Finance Committee, with various statements connected with the receipts and disbursements of 1846. These papers were transferred for publication in the number of the Journal in the press. (Part iv. of Vol. v.)

Election of Office Bearers and revision of Standing Committees.

The Secretary intimated that this being the anniversary meeting, the election of Office Bearers and revision of Standing Committees for the current year should take place. The members accordingly proceeded to the election, and unanimously re-elected as *President*, Sir J. P. Grant, and as *Vice-Presidents*, Sir Lawrence Peel and Baboo Ramgopaul Ghose. It was then proposed by Mr. W. Haworth, seconded by Captain Munro, and carried by acclamation, that William Storm, Esq., be elected a Vice-President in the room of Dr. Hufnagle, absent from India. The appointment of a fourth Vice-President was postponed till the next General Meeting, and the Secretary, in the meantime, gave the following notice of motion :—

“ That article 8 of the Regulations be reconsidered with reference to the necessity of electing two Vice-Presidents from the number of the native members of the Society.”

It was next proposed by Mr. W. Storm, and unanimously agreed to, that the Honorary Secretary and Deputy Secretary be re-elected to their respective offices.

The revision and strengthening of the Standing Committees was then entered on, and gave the following result :—

Sugar.—Messrs. G. U. Adam, John Allan, James Cowell, William Haworth, and S. H. Robinson.

Cotton.—Messrs. Joseph Willis, W. Earle, G. U. Adam, and O. Potter.

Silk, Hemp, and Flax.—Messrs. J. Willis, G. T. F. Speede, J. W. Laidlay, and W. G. Rose.

Coffee and Tobacco.—Dr. Strong, Messrs. W. Storm, and James Cowell.

Implements of Husbandry and Machinery.—Col. Forbes, Mr. H. Mornay, and Capt. W. Munro.

Oil and Oil seeds.—Dr. Mouat, Messrs. W. Haworth, H. Mornay, James Cowell, John Allan, H. C. Kemp, and Baboo Ramgopaul Ghose.

Grain Committee.—Messrs. J. Willis, W. Storm, W. Haworth, C. R. Prinsep, G. T. F. Speede, and Baboo Ramgopaul Ghose.

Nursery Garden Committee.—Messrs. J. W. Laidlay, R. Dodd, W. Hamnill, W. G. Rose, and W. Storm.

Fruit and Kitchen Garden Committee.—Messrs. G. T. F. Speede, R. Dodd, W. G. Rose, J. W. Laidlay, and Capt. Munro.

Committee of Papers.—Dr. Mouat, Mr. J. W. Laidlay, and Capt. Munro.

Finance Committee.—Messrs. M. S. Staunton, J. W. Laidlay, W. Haworth, and Capt. Munro.

The Committee for the *improvement of cattle* was removed from the list, and the addition of another member to the Committee of Papers was postponed till the next meeting.

Flower Exhibition.

A list of the plants for which prizes to the amount of Rs. 81 were awarded at the show of flowers, held on the 29th December, was next submitted. In the remarks appended to the list it is stated, that though this show was by no means a good one, it was better than had been generally anticipated in consequence of the lateness of the season. The collection of exotics was altogether larger than was exhibited at the fourth quarterly show of 1845; but the assortment of indigenous plants and cut specimens was decidedly smaller; so poor indeed that 12 or 14 sorts did not receive prizes, being either very indifferently grown, or too far advanced in flower to be deemed worthy of notice. In the exotic department there was a tolerably good collection of dahlias, chrysanthemums, roses, violets, salvias, petunias, begonias, maurandias, euphorbias, verbenas and narcissus; but the balsams, justicias, pinks, passifloras, and geraniums were poor.

The prize specimens were selected by Captain F. C. Burnett. The prizes were awarded by Sir Lawrence Peel.

Proposed application to the Court of Directors for another supply of Agricultural Seeds.

The Secretary suggested, with reference to the numerous calls on the Society for wheat, barley, oats, grass and other seeds of superior varieties, the propriety of an application to the Court of Directors, through the local government, for another consignment of seeds similar to that forwarded in 1845. This was unanimously agreed to, and it was further suggested, that the application be made without delay to admit, in the event of a compliance on the part of the Court, the receipt of the consignment earlier in the season than the last.

Applications for Silk-worms' Eggs.

A letter from Mr. Under-Secretary Beadon, enclosing a communication from the Government of Bombay, in which is conveyed an application for a further supply of silk-worms' eggs, for the use of the Superintendent of silk culture at Joonere, was next read. Mr. Beadon requests that the Society will undertake to comply with this application.

A communication from Capt. Hollings on the same subject was also submitted. Capt. Hollings mentions that he has been very successful in propagating in the public garden at Lucknow, the description of mulberry (*Morus multicaulis*) furnished to him by the Society, and is therefore desirous of making another attempt to rear the silk-worm at that station.

The Secretary intimated that Mr. Charles Blechynden, the Superintendent of the Radnagore silk filatures, had obligingly undertaken to assist the Society in meeting these applications.

Exhibition of Vegetables and Anniversary Dinner.

It was agreed that the first show of vegetables for the current year should be held on Tuesday, the 2nd of February, and the anniversary dinner on the evening of the same day.

A letter was read from Major Napleton, Honorary Secretary of the Branch A. and H. Society of Bhauglepore, applying for the annual donation from the Parent Society of two silver medals and fifty rupees. The Secretary intimated that no time had been lost in meeting this request.

For all the above presentations the best thanks of the Society were accorded.

(Wednesday, the 10th February, 1847.)

M. S. Staunton, Esq., Senior Member present, in the chair.

The minutes of the last meeting were read and confirmed, and the gentlemen proposed on that occasion were duly elected members of the Society, viz :—

Lieutenant James Young (Artillery); Messrs. William Duff; J. S. Dumergue, C. S.; E. F. Lautour, C. S.; A. G. Wilson; and Alfred Turner.

Candidates for Election.

The names of the following gentlemen were submitted as candidates for election at the next general meeting :—

Mr. J. C. Owen, Pilot Service,—proposed by Mr. Alfred Harris, seconded by the Secretary.

Mr. Hugh Fraser, Soonderbund grantee,—proposed by Mr. Harris, seconded by the Secretary.

Dr. George Tranter, of the Malwa Contingent,—proposed by Dr. Mouat, seconded by Mr. Ridsdale.

Presentations to Garden and Museum.

1. A quantity of seed of *Pinus Gerardiana*. Presented by Dr. Jameson, Supt. H. C. Botanic Gardens, N. W. Provinces.

Dr. Jameson remarks, that this description of pine is not met with under an elevation of less than 12,000 feet, and therefore well adapted for importation to Britain, as no doubt it will thrive in most localities. "In my late journey into Chinese Tartary this season"—adds Dr. Jameson, "I discovered it between Bumpa and Mulari, at an elevation of 15,000 feet, amongst *Cedrus deodara*, *Pinus excelsa*, &c. This is the first time that it has been met with in our own hill provinces."

2. Five mangosteen seedlings. *Presented by P. Homfray, Esq.*
3. Two very handsome teapots, manufactured with various kinds of wood from Penang. *Presented by Joseph Agabeg, Esq.*
4. A few curious fossil specimens. *Presented by Dr. A. H. Cheek, of Sindia's Contingent.*
5. Sample of wool taken at random from one of his bales as packed for shipment to London from the Cape of Good Hope. *Presented by Capt. Duncan Buchanan, late of the Madras Army.*

(Further particulars about this wool will be found in the body of the proceedings.)

6. A small supply of the exudation of *Butea frondosa* (*Pulass or Dhak gond*), collected in the vicinity of Eta. *Presented by G. G. Mercer, Esq.*

Mr. Mercer submits a short communication respecting the above, which was submitted to the Committee of Papers.

The motion of which notice was given by the Secretary at the last meeting,—“that Article 8 of the regulations be reconsidered with reference to the necessity of electing two Vice-Presidents from the number of the native members of the Society,”—was brought forward, but fell to the ground, in consequence of the absence of the mover.

Exhibition of Vegetables and Fruits.

A list of *mallees*, to whom prizes to the extent of 127 Rs. were awarded at the show of vegetables and fruits, held on the 2nd of February, was laid on the table. In the remarks appended to the list it is stated, that upwards of 200 gardeners were in attendance on this occasion; and that both in quantity and quality the display of foreign vegetables was exceedingly good, fully equal if not superior to the first quarterly show of last year. The show of the more delicate kinds of cabbages,—the Savoy, early York and sugar-loaf—was excellent; there were also many more baskets than usual of the *red cabbage*. The display of carrots, especially of the Altringham and long orange sorts, was good; the endives exceedingly well blanched; the peas, squash, cauliflower, lettuce, beat, kale, turnips and potatoes were likewise well represented, though the specimens of the two latter were not considered so superior as to entitle the owner to the *silver medals* which were offered to the producers of the best baskets. The same remark is applicable to the Windsor bean. Though the celery was tolerably well blanched and firm, the specimens were far behind the other vegetables, notwithstanding the handsome rewards offered to the *mallees* for good specimens.

The assortment of indigenous vegetables was limited; but some good specimens of capsicums, cucumbers, brinjalls, and Tenasserim yams were brought forward.

In the fruit department were some exceedingly well grown pomegranates ; a goodly display of long green plums (*byrs*), with fair samples of sapotas, pineapples, pummeloes and guavas. Prizes were offered for loquats, strawberries and coursop, but not a single basket was to be seen—it being too early in the season.

Messrs. Rose, Lairdlay and Speéde (members of the committee), selected the prize specimens ; and the amount was awarded by Mr. Rose.

Floricultural Exhibition.

The garden committee submitted a schedule of prizes for the first quarterly show of flowers for the current year, and suggested that it be held on Wednesday, the 24th February, at 11 A. M.—Confirmed.

Flora of Upper Assam.

The following letter from Mr. Under-Secretary Melville, with its enclosures, were next read, and the list of dried specimens of plants therein referred to was also brought to the notice of the meeting :—

To the Secretary to the Agri-Horticultural Society.

SIR,—I am directed by His Honor the President in Council to request that you will submit to the Agri-Horticultural Society, the accompanying copy of a despatch from the Agent North East Frontier, dated 6th ultimo, No. 96¹, together with the list of dried specimens of plants therein alluded to, which Mr. Masters has collected in Upper Assam.

I have, &c.,

P. MELVILLE,

Fort William :
The 16th January, 1847.

Offg. Under-Secretary to the Govt. of India.

To G. A. BUSHBY, Esq., Offg. Secretary to the Govt. of India, Foreign Department, Fort William.

SIR,—I have the honor to forward a copy of a letter from Mr. J. W. Masters, of the 1st October last, and a list of dried specimens of plants, which Mr. Masters has collected in Upper Assam during the last 4 or 5 years, and which Mr. Masters has desired me to be the medium of presenting to the Government.

2. On the 24th ultimo, I despatched the plants referred to in ten (10) chests, to the care of the Honorable Company's Calcutta Botanic Gardens, and I trust they will have reached safely.

3. This is the third collection of plants which Mr. Masters has gratuitously placed at my disposal, the first consisting of about 500 plants, was forwarded to the late Mr. Griffith, and the second consisting of a large collection, both of Assam and Bengal plants, was forwarded to the Royal Gardens at Kew.

These collections, which have been made with great care, much personal labor and exposure, at no small expense, I believe may be considered of very considerable value, and I have great pleasure in drawing the notice of Government to the liberality and public spirit, which have induced Mr. Masters to make a free gift of them, to public institutions.

*On the River :
6th December, 1846.*

I have, &c,
(Signed) F. JENKINS,
Agent Governor General.

*To Major F. JENKINS, Commissioner of Assam, and Agent to the Governor General, North-east Frontier.**

SIR,—I have the honor to inform you, that I have this day forwarded to your care, through Captain Brodie, list of dried specimens of plants collected in Upper Assam during the last three years.

2nd. You are aware that I have been collecting specimens since I have been in the province, and that I had the honor of forwarding to you a small collection (consisting of about 500 specimens) from Dikho Mookh, on the 1st September, 1841.

3rd. On the 19th June, I had the honor of forwarding a second collection of Assam plants, accompanied by a large collection from the vicinity of Calcutta, the whole of which you were good enough to forward to Sir W. J. Hooker, Superintendent of Her Majesty's Garden at Kew.

4th. I have now by me a more extensive collection than either of the former two, containing I think, upwards of 1,800 distinct species; my numbers have run up to 1,975, but I am apprehensive that many of the species which are not in blossom, have been and were entered, especially among the *Miscellanæ*; however, to counterbalance these, there are many "duplicates" without numbers, among which it is more than probable that some distinct species will be found. All the specimens of this collection (with the exception of those I have received from you) have been gathered between the falls of the Jamoona and the Brahmakoond, and constitute a fair specimen of the Flora of this part of the province.

5th. As the promotion of science is the only object I have in view in gathering specimens of plants, I have determined on forwarding this my third collection to your care, and I beg the favor of your presenting it to the Hon'ble the Deputy Governor of Bengal, to be disposed of in such manner as His Honor may consider most likely to render it of public utility.

6th. The specimens are thrown roughly together into families according to Lindley's arrangement, and may be conveniently connected by Botanists, but full reliance must not be placed on the specific names which I have given them, as I have not had the necessary books of reference at hand to enable me to determine genera and species.

7th. I shall despatch the specimens immediately I can get a boat to take them, but having no boxes here fit to put them into, I must beg the favor of your having them more securely packed at Gowhatty.

Gollah Ghaut :
The 1st October, 1846.

I have, &c.,
(Signed) W. J. MASTERS,
Sub-Asst. Commissioner.

Growth of Wool at the Cape.

The following letter from Capt. Buchanan accompanying the sample of wool referred to among the presentations was submitted :—

To the Secretary Agricultural Society of India.

SIR,—I have noticed in the newspapers with much satisfaction the encouragement given to the growth of wool by the Agricultural Society of India, and do not doubt by a continuance of its valuable support and through the medium of its reports affording such information to flock masters as will tend to promote the object, wool of a very superior quality may in the course of a few years be produced in India with great success.

From my knowledge of the climate and pasture of India, and the circumstance of having directed my attention to sheep in this colony since my retirement from the Madras Army, I am enabled to judge of the result which would attend a judicious management of them in India, and have no hesitation in affirming that in the Mysore, the hills, and in fact most parts of India, the finest wool-bearing sheep may be had to any extent, and with less risk yield a larger return to the landholder than any other investment of capital. In 1841 I commenced in this colony with an importation of rams selected from the best Merino flocks in England, viz : Lord Western's, General Dorian's, and Mr. Tower's, and with ewes of pure Saxon breed have established a stock combining a beautiful degree of fineness and length of staple commanding the approbation of the London brokers, and the Highland Agricultural Society who did me the honor of placing a sample of it in their museum in Edinburgh.

Should the Agricultural Society of India think it desirable to introduce this blood into any of the flocks which are now receiving proper attention in the Bengal Provinces, and relieve me from the expense of conveyance and freight, I shall have pleasure in presenting six rams to the Society to be distributed amongst the competitors for the wool prize in such manner as the Committee may consider best.

The wool from my flock of between two and three thousand sheep has for five years sold in London from 1s. 6d. to 2s. 5d. per lb., and the greatest care has been observed in maintaining the pure blood of the rams. These are sold on my farm for 5l. a head, and should any parties wish to get them at that

rate, I shall be glad to supply them and have them conveyed to Cape Town for shipment at the least possible expense to purchasers.

• I am, &c.,

Vale of Endric, Cape of Good Hope :

DUNCAN BUCHANAN,

November 5th, 1846.

Captain, Retired List, Madras Army.

It was directed that the best thanks of the Society be given to Captain Buchanan for his handsome offer, with an intimation of its inability to accept of it, in consequence of this branch of husbandry no longer forming a part of its proceedings. It was further agreed, with the view of making the offer contained in the closing paragraph of Capt. Buchanan's letter more generally known, that it be published in full in the proceedings, and that a copy of it be sent to the Bhaugleapore Branch Society, and to such other members as are interested in sheep rearing.

Communications on various subjects.

The following communications were also read :—

1.—From J. Thornton, Esq., Secretary to Government, N. W. P., forwarding copy of reports by London Brokers on tea grown and manufactured in Kemaon and the Deyrah Dhoon.

2.—From G. A. Bushby, Esq., Secretary to the Government of India, intimating that the Society's application for a further supply of agricultural seeds will be transmitted by the next mail to the Hon'ble the Court of Directors.

3.—From Cecil Beadon, Esq., Under-Secretary Government of Bengal, returning the thanks of the Deputy Governor for the assistance rendered by the Society in the procuring of seed paddy for despatch to Arracan.

4.—From Major Napleton, Honorary Secretary Branch Agricultural and Horticultural Society of Bhaugleapore, acknowledging the receipt from the Parent Society of the usual annual donation of two silver medals and fifty Rupees.

5.—From Dr. C. Palmer, Secretary Branch Agricultural and Horticultural Society, Hooghly, requesting to be furnished with the usual donation, to be awarded at a show of vegetables and fruits to be held at that station about the middle of February.

6.—From the Rev. Dr. Duff, intimating his readiness to meet the wish of the meeting by accepting of the vacant office in the Committee of Papers.

The name of Dr. Duff was accordingly added to the Committee.

7.—From James Cowell, Esq., suggesting that a further supply of madder seed be procured from the south of France, and offering his services towards obtaining it.

The thanks of the Society were given to Mr. Cowell for his kind offer, and the sum of fifty Rupees was accorded for this purpose.

(Wednesday, the 10th March, 1847.)

The Honorable Sir J. P. Grant, President, in the chair.

The minutes of the last meeting were read and confirmed, and the gentlemen proposed on that occasion were duly elected Members of the Society, viz :—

Messrs. J. C. Oweh, Hugh Fraser, and Dr. George Tranter.

Presentations to Library.

1.—Journal of the Royal Asiatic Society of Great Britain and Ireland. *Presented by the Society.*

2.—Journal of the Asiatic Society of Bengal, Nos. 173-174, and supplementary number.

Garden.

1.—Four plants of the bread-fruit tree from Egypt. *Presented by Dr. Hufnagle.*

The Secretary stated that these plants had reached in a very sickly condition, and though sent immediately to the Society's nursery, and put under careful treatment, three had since died, and the fourth has little sign of vitality.

2.—Twenty-two pots of Geraniums of various kinds, some reared from seed and others from cuttings, and sixteen pots of various other ornamental plants. *Presented by L. Manly, Esq.*

3.—A few very pretty cut specimens of Anemones, the produce of his garden at Howrah. *Forwarded for exhibition by H. Alexander, Esq.*

Nursery Garden ; cane plantation ; suggestion for the establishment of a school for gardeners.

A report from the garden committee was read. The Committee refer to the distribution of cane during the past season which has been sufficient to meet, within 200 Rs. the ordinary expences of the garden for the past year. They state they have had a few additional plots laid out with cane, to allow other parts to lie fallow, and to keep up a sufficient stock for a probable demand during next season. The Committee further intimate that they have appropriated about a couple of beegahs as a vegetable garden on which to raise seeds for distribution to members. They report that the new residence for the overseer, as also other works which were in progress, have been satisfactorily completed, and recommend that a small sum (Rs. 57) in excess of the estimate be allowed. They next enter into a few other details connected with the garden, and suggest the appointment of a head gardener to attend to the floricultural department. The Committee add, in conclusion, that they have taken into consideration the propriety of endeavoring to establish, at the nursery, a school for gardeners, to assist in meeting

the numerous applications from Mofussil members for men of this class whose services can be depended on. They state, that they have directed the overseer to make enquiries as to the feasibility of the scheme before entering further into it. This information obtained, they will be in a better position to submit to the Society their views on a subject which, they conceive, to be well deserving of support.

The report of the Committee, in all its parts, was unanimously confirmed.

Floricultural Exhibition.

A list of prizes, amounting to Rs. 128, which were awarded at the show of flowers held on the 24th ultimo, was next submitted. ° The following are the remarks appended to the list :—

This show was far superior to any that has yet been held. The hall was completely filled with the collection of plants that was brought forward. There were many well grown plants of begonias, oxalis, maurandias, phloxes and variegated larkspurs. The size and formation of the flower of the hearts-ease, though open to improvement, was much better than that of last year ; there were also more specimens of the sweet pea, portulacas, lophospermum, and petunias ; of the latter, three or four sorts were exhibited with large well-formed flowers,—likewise five or six kinds of verbenas. Among other exotic annuals were several plants of clarkias, linarias, nemophilas, pentstemon, antirrhinum, nolas, scizanthus,—and a well grown plant of cosmea bipinnata—a Mexican annual. In the department of cut specimens was an excellent collection of roses and a fair assortment of dahlias, considering that it was late in the season for them. Among the bulbous and tubercous plants, were a few hyacinths, (the first that have been exhibited) in full flower, narcissus, anemones, and iris, and antholyza præalta. Of plants not named in the printed list, were porana racemosa, bignonia (chirere ?), magnolia, borowallia, polemonium cæruleum, and a few other plants which considerably assisted in adding to the interest of the show.

A fuchsia,—the best yet brought forward—was submitted by Mr. McClintock. A prize was offered for carnations, but there was not a single plant. The violets were poor. There were several well grown plants of poivre coccinea ; and two exceeding fine specimens of euphorbia jacquiniiflora from the Society's garden.

Captain Munro and Captain Burnett selected the prize specimens. Mr. Mackilligan awarded the prizes.

Defaulters to the Society.

The Finance Committee in virtue of the authority vested in them, submitted for publication the names of the three following gentlemen as defaulters to the Society ;—

Defaulters under the Resolution agreed to at a meeting on the 16th September, 1842 ; viz : “ that the Finance Committee have the power to revise from time to time the list of subscriptions in arrear, and that they be empowered to publish periodically the names of those defaulters, the recovery of whose subscriptions is hopeless :”—

Baboo Munneeram Burr Bundaree of Assam, for subscription unpaid during four years ; and Mr. W. C. Tremblehausen, for subscription unpaid during a like period.

Defaulter under the Resolution passed at a meeting of the 14th June 1843 ; viz :—“ That when a member of the Society intimates his desire to cease to be a member, his name be forthwith erased without continuing his subscription, subject, nevertheless, to his name being published among the defaulters if his arrears of subscription are not paid :”—

Dr. Henry Sill, for three years' subscription due at the period of his resignation, in August 1844.

Award of a Silver Medal to the Darogah of the public garden at Lucknow.

A letter from Capt. George Hollings, of Lucknow, was next read. After alluding to the safe arrival of a supply of silk-worms' eggs sent to him by the Society ; referring to the progress making in the public garden under his superintendence ; and stating that he has found oil-cake an antidote to the attacks of the white ant on sugar-cane, and that his gardeners are so convinced of its efficacy, that they apply it to the roots of any tree attacked by those destructive little insects ;—Capt. Hollings goes on to observe as follows :—

“ The Darogah of the garden has paid great attention to my orders, and superintended all the experiments I have been induced to try ; he has been very successful, especially in producing celery, which some persons, who have lately come or returned from England say, is as fine as any they saw at home in size, solidity, and flavor. I have promised him that I would, if possible, procure for him a medal from the Society, can you tell me how this can be done ? It would afford great encouragement to persons in a similar situation, and materially assist me in my efforts to impress on the minds of the native gentlemen in this part of the world the interest which the Society take in the advancement of agriculture, and the cultivation of all products which afford food for the human race, or add to the commercial wealth and resources of a country.

You will find that we have never asked for any pecuniary assistance from the Parent Society, nor is it likely that we shall ever require any. We could ourselves reward the Darogah, but it would not have the moral effect that would be caused by the bestowal of a medal by the Society in Calcutta on the recommendation of the manager of our garden.”

Proposed by Captain Munro, seconded by the Secretary, and unanimously agreed,—that the recommendation of Captain Hollings be complied with:

Communications on various subjects.

The following letters were also submitted :

1.—From Dr. C. Palmer, Secretary Branch Society at Hooghly, giving a few remarks about the show of vegetables held at that station, in January last.

2.—From Major Napleton, Secretary Branch Society at Bhaugleypore, forwarding a full and interesting account of a show of vegetables and flowers, held at that station, on the 26th January.

3.—From J. O. Price, Esq., Government Cotton Planter at Dacca, intimating the safe arrival of the Scotch *churkas* sent by the Society, on the requisition of the Commissioner of Dacca ; and promising to give a report in due course on their working qualities.*

4.—From Col. J. R. Ouseley, stating that, as requested by the Society, he has despatched to Major Jenkins at Assam, and Capt. Studdy at Mussooree, a quantity of coffee seed, the produce of his plantation at Burkaghur.

The Secretary also read a correspondence between the Under-Secretary to the Government of Bengal, the Civil Architect and himself, respecting a supposed settlement of portions of the Metcalfe Hall, and suggested, in connection therewith, the propriety of an application to Government on the subject of future repairs to the building.

The suggestion was agreed to, and the Secretary was requested to prepare a draft of such application for the approval of the next general meeting.

For the above communications and presentations the best thanks of the Society were accorded.

(Wednesday, the 14th April, 1847.)

The Honorable Sir J. P. Grant, President, in the chair. .

The minutes of the last general meeting having been read and confirmed, the following donations were announced :—

For the Library.

1.—Travaux de la Société d' Histoire Naturelle de l Ile Maurice, from 6th October 1842 to 24th August 1846. *Presented by the Society.*

2.—Journal of the Royal Asiatic Society of Great Britain and Ireland, Vol. x. part 1. *Presented by the Society.*

3.—Journal of the Asiatic Society of Bengal. Nos. 175 and 176. *Presented by the Society.*

4.—Calcutta Journal of Natural History, No. 28. *Presented by Dr. McClelland.*

For the Garden and Museum.

1.—A small supply of Cape acorns. *Presented by F. W. Russell, Esq.*

Mr. Russell has also sent the Society an additional supply for the gardens at Bhanglepore, Lucknow and Saharunpore.

2.—A few dried specimens of the "Rose of Jericho," and a cone of the cedar of Lebanon, procured in his recent journey in Palestine. *Presented by Dr. Hufnagle.*

3.—A few sorts of Cape geranium seeds. *Presented by T. Bayley, Esq.*

4.—A small supply of seed of American Sumach, (*Cassalpinia coriaria*) the produce of the H. C. Botanic Garden, Calcutta. *Presented by Dr. McClelland.*

All the above seeds are available to members.

5.—A few plants of tulips, hyacinths, crocus, and snowdrop. *Presented by Captain R. Ouseley.*

Captain Ouseley sends these plants as specimens of the produce of his garden at Burkaghur, Chota Nagpore, where, he mentions, they have been blossoming freely; the bulbs were received in November last from England by the overland route. Captain Ouseley promises to send the Society a good supply of every kind of bulbous root in his garden during the rainy season.

6.—A small collection of geraniums. *Presented by Geo. Wood, Esq.*

7.—Specimens of two kinds of Arracan rice, *Latoores* and *Nakrinsee*, cleaned by machinery in the United States. *Presented by Major Bogle.*

8.—A few of the dye stuffs of Upper Assam, and a sample of Moonga silk cloth, woven and dyed by the Phakials, a tribe of Shans in the neighbourhood of Jeypore. *Presented by Major Jenkins.*

9.—Specimens of raw silk, the produce of the mulberry worm, reared from eggs supplied by the Society. *Presented by Capt. G. E. Hollings.*

Exhibitions of Flowers, Vegetables, and Fruits.

Two reports were submitted from their respective committees, submitting schedules of prizes to be awarded for certain specimens of flowers, fruits and vegetables; the flower show to be held on 16th April, at 11 A. M., and the vegetable and fruit show on the 11th of May at 10 A. M. The lists were confirmed. It was also agreed that the fruit and kitchen garden committee take into consideration the propriety of having fewer prizes but of larger amount for the future, and of awarding a larger number of silver medals for certain rarer kinds of fruits and vegetables.

Defaulters to the Society.

The Finance Committee, in virtue of the authority vested in them, submitted for publication, the names of the two following gentlemen, as defaulters

to the Society, for subscription unpaid for four years, and the recovery of which is considered hopeless :—viz.

Baboo Callychunder Lahoree, of Cooch Behar, and Baboo Rajmohun Roy Chowdry, of Rungpore.

The Dyes of Upper Assam.

An interesting communication to the address of Major Jenkins, drawn up by Major Hannay, relating to some of the dyes in general use among the Assamese and Phakeals, a tribe of Shan® on the frontier, was next submitted. Major Hannay states, that he has not been able to collect all the information he could desire on this subject, but he hopes to obtain further particulars at some future period ; in the meantime he sends the specimens referred to above with remarks on the mode in which they are applied, &c. Major Hannay's paper was referred to the Committee for publication in the Journal.

Silk culture at Lucknow.

The subject next brought to the notice of the meeting had reference to the specimens of raw silk forwarded from Lucknow by Capt. Hollings.

After alluding to the award, at the last meeting, of a silver medal to the Darogah of the public garden at Lucknow, and conveying his best acknowledgments to the Society for the attention paid to his wishes in this matter, Capt. Hollings offers the following remarks regarding the silk :—

“ Having performed an act of justice in reference to the award of this medal, I beg to attract your attention to the enclosed specimens of silk produced by the worms, the eggs of which you kindly induced a member of the Society to forward to me.

I deemed it right to offer the first specimen to His Majesty the King of Oude, who has evinced a great interest in the manufacture of the silk, the second specimens were given to the influential merchants here—the third forwarded to the Governor General through his Foreign Secretary, and the fourth are now sent to you. I will send you a larger quantity by and bye, but I should like to know the opinion of the noscent in Calcutta as regards the small quantities now forwarded.

It may be interesting to many, but especially to yourself, to know that the young worms were fed on the leaves of the ‘*morus multicaulis*,’ which you so kindly and voluntarily sent to me ; at a subsequent stage the supply of leaves of that particular plant failed, and I was obliged to feed them on the indigenous mulberry. I have to thank you for the proceedings of the Society referring to silk worms which you forwarded, but I was so pressed for time that I was obliged to invent the winding wheels, and with one exception, all the specimens forwarded have been wound off by myself or by members of my family, and therefore every excuse ought to be offered and acknowledged for any imperfection in the material.

It is my intention to send specimens to Delhi, Meerut, Benares and Bombay, to ascertain the market value of the silk. I am fully aware that it is more

than likely that some failure will take place during the hot winds which have not yet commenced, but I entertain a firm hope that I shall be able to preserve the worm—throughout the year—if not we must depend on Bengal for a supply of eggs, and trust to our sandy soil with water near the surface to preserve the *morus mulicaulis* in its pristine vigor; and if we only succeed to such an extent we may be confident of getting one good marketable season of silk culture during the year.”

The Secretary mentioned that he had submitted these specimens to Mr. Laidlay, a member of the Silk Committee, who is of opinion, that it has been too finely reeled—so fine indeed, that it would be a vain attempt to unwind a skein of it; in its present state therefore it is unmarketable. Mr. Laidlay suggests that a skein of good Bengal silk be sent as a muster (which has been done) and he adds, “Captain Hollings ought to reel off 8 or 10 cocoons in one thread, keeping steadily to that number to maintain an uniform thickness, when I make no doubt a person of so much perseverance will ultimately overcome all difficulties.”

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Communications on various subjects.

The following letters were also submitted :—

1.—From Cecil Beadon, Esq., Under-Secretary to the Government of Bengal, dated 7th April, asking, on behalf of Government, for such information as the Society can supply regarding useful timber trees found in the provinces of Bengal.

2.—From Mr. James Carter, Seedsman, London, intimating, in reply to the Society's order, his intention of forwarding a consignment of flower seeds by the overland conveyance to reach this in the first week in October.

3.—From Mr. Landreth, Seedsman, Philadelphia, acknowledging the Society's order for a large consignment of vegetable and flower seeds, and stating that it shall have his best attention. This supply may be expected to reach in all August.

4.—From C. Beadon, Esq., Under-Secretary to the Government of Bengal, forwarding a copy of a letter from the Civil Architect, regarding certain repairs required to the Metcalfe Hall, especially to the SE. column of the eastern portico, which Major Goodwyn recommends should be taken down and rebuilt.

In connection with this subject the Secretary submitted draft of a letter to Government, (which by a resolution of the last meeting he was requested to prepare,) soliciting that the Metcalfe Hall be placed under the supervision of the Military Board, in order that all necessary repairs may from time to time be properly attended to and the stability of the edifice thereby fully ensured.

The draft was unanimously agreed to, and the Secretary was requested to forward a copy of the same to Government without delay.

For all the above communications and presentations the best thanks of the Society were accorded.

(Wednesday, the 12th May, 1847.)

The Hon'ble Sir J. P. Grant, President, in the chair.

The minutes of the last meeting having been read and confirmed, the names of the following gentlemen were submitted as candidates for election at the next meeting :—

Henry Cope, Esq., Delhi,—proposed by the Secretary, seconded by Mr. Agabeg ;

A. R. Young, Esq., Civil Service,—proposed by Mr. Beadon, seconded by the Secretary ;

Baboo Pottit Pharbun Sen, Calcutta,—proposed by Baboo Ramgopaul Ghose, seconded by Mr. W. Haworth.

Presentations to Garden and Museum.

1. Twelve mango seedlings from a superior stock from his garden at Jungypore. *Presented by J. Maseyk, Esq.*

2. A plant of *Glycine* —, and of *Pelargonium peltatum*. *Presented by G. Wood, Esq.*

3. A small supply of Sydney maize seed. *Presented by G. T. F. Speede, Esq.*

4. Specimens of coffee, husked and unhusked, and seed of a gigantic climber, (*Mimosa scandens*.) *Presented by Col. Ouseley.*

Col. Ouseley states, that the coffee is of this year's growth. He sends it in a cleaned and unhusked state for a comparative trial, as he thinks the retention of the husk improves the flavor.

5. Specimens of cleaned cotton and seed from the Coimbatore farms. *Presented by Dr. Wight on behalf of Mr. Petrie, Government Engineer.*

(Full particulars about these samples will be found in the body of the proceedings.)

Floricultural Exhibition.

A list of prizes, amounting to Rs. 97, which were awarded at the show of flowers held on 16th April, was submitted, and the following remarks appended thereto, were read :—

“ The collection at this show was not larger than that brought forward in the second quarterly exhibition of 1846, but the assortment was more select.

“ The specimens of phloxes, portulacas, ixoras, verbenas and sweet-williams were good. The asters, pink, snapdragon and amaryllids were also very fair, and next the petunias, saponarias, coreopsis and xeranthemum. There were two or three branches, in full blossom, of poinciana regia, and one of magnolia grandiflora ; also several well grown young trees of cordia sebestena, and a good collection of climbers in pots. The carnations, rondeletias and mesembryantheums were not brought forward ; a few other plants, not included in the printed list, were therefore substituted, such as lobelias, lychnis,

echium, silene, hydrangea and brachycome ibiridifolia. The roses (cut specimens) were indifferent, as were also the begonias and justicias. Nevertheless, the show was a good one, and a decided improvement on its predecessors.

"Capt. Munro and Capt. Burnett selected the prize specimens, and Mr. W. P. Grant awarded the amount."

Election of a Vice-President.

Baboo Ramgopaul Ghose, a Vice-President of the Society, intimated to the meeting that, in accordance with the request made to him on a former occasion, he had instituted enquiries with the view of ascertaining whether among the native members of the Society he could suggest one whom it would be desirable to elect to fill the office of a fourth Vice-President, which had been vacant since the last anniversary meeting; that he knew of no one who, from the nature of his pursuits, and the active interest he took in the proceedings of the institution, while he was permanently resident in Calcutta, (which for the future he was likely to be) was so well qualified for the post as the Rajah Sutteechurn Ghosaul, a gentleman who had on a recent occasion handsomely assisted the Society with a pecuniary loan, free of interest. He therefore begged to propose him for that office. The nomination was seconded by the Hon'ble the President, supported by the Secretary, and unanimously agreed to.

An improved machine for divesting indigenous Cotton of its Seed.

The following communication from Dr. Wight, Superintendent of the Government Cotton Farms at Coimbatore, with its enclosure, were next read :—

To JAMES HUME, Esq., Honorary Secretary Agri-Horticultural Society.

MY DEAR SIR,—Fully impressed with the importance of the subject and the value the Society attaches to the possession of a machine adapted for the expeditious and economical separation of the cotton from the seed of indigenous cotton, I have much pleasure in forwarding copy of a letter on the subject of a saw-gin recently constructed here for the purpose by Mr. Petrie, the engineer attached to this establishment, which seems well adapted for the purpose. It has now been in constant use for about a month on both American and native cotton, and works well on both, but certainly best on the latter. As compared with the Churka it is more expeditious, and seems to clean the seed as well, so far as cotton is concerned, but without taking any of the knap which adds to the weight of the marketable article, but lessens its value, as it must all be taken out before it is spun. The only point, on which we have not yet compared it with the Churka, is the relative percentage of cotton to seed which they respectively yield, in cleaning the same batch of *kuppas*, in the same way as we have compared it with the gin constructed

for cleaning American cotton. It is certainly desirable to know this as furnishing an estimate of the extent to which Churka-cleaned cotton is deteriorated by the admixture of "shorts," but to this extent only I consider the question of importance, as the gin seems to remove all the cotton of sufficient length of staple to be spun. By calculation from data obtained from native merchants the difference in favor of the Churka is under 1 per cent., which I should think near the truth. According to their statements, average *kuppas* yields about 23½ per cent. of wool; the gin on cotton of this season's growth, which is of inferior quality, has, as the result of several trials, given 22.8 per cent.: which I look upon as a high average return.

Viewed therefore with reference to the speedy, economical and perfect manner in which it does its work, in cleaning native cotton, I look upon this machine as the nearest approach yet made to perfection, though there may still be room for improvement.

In forwarding Mr. Petrie's letter I have thought it right to support his statements to this extent, as the machine having been made up in the farm stores, and tried in the Government gin house, I have witnessed its whole progress step by step from its commencement to its completion, and finally purchased the first completed machine for Government on the conviction of its superiority, as compared with all the others I have yet seen tried.

The samples were despatched a few days ago, and may, I believe, be looked for within a few days after the receipt of this note. •

The cotton crop of the present season in this district is, I am sorry to say, very inferior both in quantity and quality for want of rain at the proper season. The rains which we should have had in November seem to be falling now. I certainly have never seen more rain, at any one time during the monsoon, than we have had here during the last week, equalling as it does, the aggregate amount of all last year, or about 6½ inches.

I remain, &c.,

Coimbatore: 19th April, 1847.

(Signed)

ROBT. WIGHT.

To DR. WIGHT, Superintendent Cotton Farms, Coimbatore.

DEAR SIR,—I have seen a number of communications in the Journal of the Agricultural and Horticultural Society of India of late, on the subject of divesting cotton of its seed, and I observe that a prize is now offered by the Society, in conjunction with Major Jenkins, for an improved "Indian Churka," so as to make an efficient and serviceable Machine, and such as shall meet the approval of the Society.

I further observe, that a very general opinion prevails as to the impossibility of ever making the saw-gin as serviceable a machine for the speedy and economical cleaning of the Indian cotton with its short fibre and strongly attached small seeds, as it is for the larger and less adhesive seeds of the American cotton.

My object in writing to you on the subject is to request the favor of your forwarding the accompanying packets of seeds and cotton to the Secretary of the Society for examination, under the impression, that they go far towards proving that opinion erroneous.

Nos. 1 and 2 are a packet of seeds and a sample of the same cotton cleaned by gin that I have just constructed expressly for cleaning Indian cotton.

Nos. 3 and 4 are a packet of seeds and a sample of the same cotton cleaned by a gin constructed for American cotton.

Nos. 5 and 6 are a packet of seeds and a sample of the same cotton cleaned by the native Churka.

The only difference between the gin for cleaning Indian, and that for American, cotton is that the teeth of the saws of the former are much smaller, and the saws set a little closer to each other, than they are in the latter.

The suggestion to have finer saws for the Indian cotton, originated with one of the American cotton planters who was located at Coimbatore for 2 or 3 years. The correctness of his idea was confirmed by observing that if the gin was suddenly stopped by casting off the drum belts, when cleaning Indian cotton, numerous seeds were found sticking between the teeth of the saws, which was not the case when we were working on American; and as it appeared natural, that this defect would be obviated by having saws with smaller teeth, I recommended the propriety of a set of finer saws being procured from England for trial. These were accordingly ordered by Government, and early in 1845, a gin fitted up with them was set to work on native cotton. These were an improvement, but the teeth of this first set were found to be too long and slender for the work. Being now desirous of giving the thing a better trial, I wrote home to have two sets of saws intermediate between the larger American and too fine experimental set forwarded on my own account. The American saw has 7 teeth to the inch, the experimental ones had 12, and were of a disproportioned length of tooth; the new ones have 10.

The gin has been at work for about a month, and the result is highly satisfactory, the teeth stand well, it cleans the seed so much better than our other gins, that the out-turn of wool to seed cotton is from 1 to 1.2 per cent. more; for example;—From 100 lbs. of seed cotton (Indian) our gins constructed for the American cotton gives 21.5 lbs. of wool, the Indian cotton gin gives 22.7 lbs. The time given to perform a given quantity of work is nearly the same as our other gins, as will be seen by the following experiments promiscuously taken from a number recorded:

MARCH 20TH, 1847.

1st Experiment with 2nd sort American Cotton.

2 Gins at work by cattle power.

No. 1. Gin, 60 Saws, cleaned 100 lbs. seed cotton in 35 minutes.

No. 4. " 28 " " 50 " " 36½ "

APRIL 1ST, 1847.

2nd Experiment with Indian Cotton.

3 Gins at work by cattle power.

No. 2. Gin, 62 Saws, cleaned	100 lbs. in	37 minutes.
No. 3. Gin, 60 „ „	100 lbs. in	39 • minutes.
No. 4. Gin, 28 „ „	50 lbs. in	36 minutes.

APRIL 2ND, 1847.

3rd Experiment with Indian Cotton.

2 Gins at work by cattle power.

No. 2. Gin, 62 Saws, cleaned	100 lbs. in	35 minutes.
No. 4. Gin, 28 „ „	50 lbs. in	34 minutes.

APRIL 7TH, 1847.

4th Experiment with Indian Cotton, the small being driven by hand.

No. 3. Gin, 60 Saws, cleaned	100 lbs. in	36½ minutes.
No. 4. Gin, 28 „ „	50 lbs. in	35 minutes.

APRIL 8TH, 1847.

5th Experiment 1st sort with American Cotton.

No. 3. Gin, 60 Saws, cleaned	100 lbs. in	32 minutes.
No. 4. Gin, 28 „ „	50 lbs. in	34½ minutes.

APRIL 5TH, 1847.

Experiments on the out-turn of Lint to Seed Cotton by the new Gin on Indian Cotton.

The weight of seed Cotton Ginned was 250 lbs. 	Seed.....	191 lbs.
	Cotton....	57 lbs.
	Dirt extracted by the thrasher.	1 lb.
	Ditto from flue.	1 lb.

This gives 22.8 per cent. of Cotton Wool..... 250 lbs.

Experiments on the out-turn of Lint to Seed Cotton by one of the Gins with the large-toothed Saws on Indian Cotton.

The weight of seed Cotton Ginned was 500 lbs. 	Seed....	389 lbs.
	Cotton.	108 lbs.
	Dirt extracted by thrasher.	1½ lbs.
	Ditto by flue... ..	1½ lbs.

This gives 21.6 per cent. of Cotton Wool.... 500 lbs.

NOTE.—No. 1 is a 60 in. saw-gin made in America.

Nos. 2 and 3 were made up in the Coimbatore stores, with saws adapted for the American cotton.

No. 4 was also made up on the Cotton Farms but with fine toothed saws for Indian cotton.

From this it will be seen, that when working on Indian cotton, the advantage in time is a little in favor of the small gin ; while on the other hand, the large-toothed saw has a little advantage when the trial is with American cotton.

I regret that the Society confine competitors for the prize to the improvements of a particular kind of machine ; had the terms been more general and the prize been offered for the most efficient and serviceable machine for cleaning Indian cotton, I could have forwarded my hand-gin for trial with some hope of success. Perhaps the Society may, on re-consideration, be induced to modify the restrictive clause, especially when it is added, that all the reports we have received of sales of the gin-cleaned and churka-cleaned cotton give ½d. per lb. in favor of the former.

I may mention for the information of these who wish to try by a gin of this sort, that Mr. Laird, of Birkenhead, procured the saws and brushes for me. These were the only articles I had to get from England : the gin frame was made here and the gin fitted up entirely by native workmen.

(Signed) J. PETRIE, *Engineer.*

Resolved,—That the best thanks of the Society be accorded to Mr. Petrie for his interesting communication, and to Dr. Wight for his kindness in forwarding it ; further, that the Secretary be requested to intimate with reference to the last paragraph but one of Mr. Petrie's letter, that the object of restricting the gold medal and prize of 500 Rs. to an improvement on the *Indian Churka*, is to ensure a machine which should not only effect its work quickly and efficaciously, but be of a sufficiently moderate cost to admit of its being employed alike by the poorer as by the richer classes, interested in cotton cleaning.

In connection with this subject, the Secretary brought to the recollection of the members, a communication from Mr. Robert Burn, (which had been read at the April meeting of last year of the Society), regarding "an improved machine on the churka principle for cleaning cotton," and mentioned that though the Government of Bombay, in whose custody the machine was placed, had been requested by the local Government to send it round by the first opportunity, it had not yet come to hand.

Resolved,—That the Secretary do again place himself in communication with the local Government on this subject.

Formation of a Public Garden at Cawnpore.

A letter was read from Dr. Goodeve, Civil Assistant Surgeon at Cawnpore, stating that Mr. Montgomery, the Magistrate, had established a large garden for public purposes at that station, and requesting to be informed whether

the Calcutta Society would give any assistance in the shape of good English, Cape or American vegetable seeds. Dr. Goodeve adds, that the main object in the formation of this garden is to improve the Horticultural products of the district by raising and distributing good fruit trees and vegetable seeds among the gardeners and cultivators, and the second object is to make the garden partly support itself by the sale of good vegetable produce.

Resolved,—That every available assistance be afforded to this newly-formed garden.

Communications on various subjects.

The following letters were also submitted :—

1.—From C. Beadon, Esq., Under-Secretary Government of Bengal, intimating, in reply to the Society's application, that the Hon'ble the Deputy Governor is not willing to place the Metcalfe Hall under the charge of the Military Board to be repaired at the public expense.

Resolved,—That the defective column of the Eastern portico of the Building be repaired or rebuilt with the least possible delay ;—that copies of the late correspondence on the subject of the Building be sent to the Curators of the Public Library, with a request that they concur in contributing half the expense of this repair ; and that Col. Sage be solicited to superintend the same. Col. Sage, who was present, kindly consented to do so.

2.—From Major Napleton, Honorary Secretary Bhaugleapore Branch Society, offering to send a quantity of acclimated seed of the finest sorts of cauliflower, artichoke, lettuce and turnip, for the use of the Parent Society. Major Napleton adds, "this has been a most splendid seed harvest here ; our public garden was never so rich in splendid acclimated vegetable seeds as it now is ; indeed our last season's vegetables were the admiration of all who saw them."

3.—From the Under-Secretary Government of Bengal, applying for a quantity of cotton seed for the Government experimental plantation at Dacca.

4.—From a member, suggesting that a certain sum be placed at his disposal by the Society for making experiments in cotton culture at a depopulated village belonging to him in the Upper Provinces, which he is willing to give for the purpose, rent free.

Resolved,—That the thanks of the meeting are due to the proposer of the above, but that his offer be declined, the same not being strictly compatible with the objects of the Society.

A letter was also submitted from a gentleman who was formerly a member, and wished to rejoin the Society, requesting to be informed if it were necessary for him to pay an admittance fee a second time. The Secretary mentioned that there was no rule of exemption under such circumstances, and the meeting were of opinion that it was not expedient to make one.

For all the above communications and presentations the best thanks of the Society were accorded.

(Wednesday, 9th June, 1847.)

Rajah Sutteechurn Ghosaul Bahadoor, Vice-President, in the chair.

The minutes of the last meeting were read and confirmed, and the gentlemen proposed on that occasion were ballotted for and duly elected Members ; viz :—

Henry Cope, Esq., A. R. Young, Esq., C. S., and Baboo Pottit Paubun Sen.

Candidates for Election.

The names of the following gentlemen were submitted as candidates for election at the next meeting :—

Capt. Wm. Lamb (51st Regt. N. I.), Major of Brigade to the Troops in Oude,—proposed by Capt. G. E. Hollings, seconded by the Secretary.

Baboo Pearychund Mitter,—proposed by Rajah Sutteechurn Ghosaul, seconded by the Secretary.

Presentations to Garden and Museum.

1.—A specimen of Tirhoot sugar. *Presented by W. S. Kelly, Esq.*

Mr. Kelly states, that this sugar, the produce of the Nepaul red cane, was manufactured without any refining process, in open pans, at Messrs. Owen, Allhusen and Co's. factories in Tirhoot, and that the cane yielded at the rate of Br. Mds. 30 of sugar per beegah, which he believes to be considerably in excess of the quantity usually produced from the ordinary description of country cane hitherto planted in the district. Mr. Kelly sends this specimen in consequence of his Brother, Mr. Thomas Kelly, having presented to the Society a few canes of the same description in October last.

The Secretary mentioned that the canes referred to were now thriving most vigorously in the Society's Nursery Garden, and had much the appearance of the sort known as the "Bombay red cane." The sugar, he added, had been pronounced "a strong grained yellow sugar," and valued at eight rupees per maund.

2.—A sample of timber from Assam. *Presented by Major Jenkins.*

Major Jenkins sends this specimen, which he supposes to be the produce of a *Bridelia*, to add to the Society's stock of woods from Assam : he states it is very plentiful in parts of that province, but seldom used by the Assamese carpenters on account of its hardness.

The Secretary intimated that he had transferred the leaves and fruit of this tree, as received from Major Jenkins, to Capt. Munro, who had recognized them as belonging to *Bridelia longifolia*, Roxb.

3. A plant of *Lycim* ———. *Presented by Mr. Robert Wood, Junr.*

4. A box manufactured of sandal wood, the produce of the H. Co's. Botanic Garden, Calcutta. *Presented by Mr. Joseph DeCruze, Overseer of the Society's Nursery Garden.*

This wood was much admired for the quality of its grain and its fine perfume.

5.—Two kinds of *dall* of the Hill species and a quantity of turmeric tubers ; also a small supply of *Dahlia* seed affording flowers of various colors, the produce of his garden at Burkaghur, Chota Nagpore. Presented by Col. J. R. Ouseley.

6.—A large supply of Jushpore seed paddy. Presented by Col. Ouseley.

This paddy has been sent by Col. Ouseley for transmission to Major Bogle, Commissioner of Arracan, to aid that officer in his endeavours towards the introduction of superior varieties of grain into the province under his charge.

7.—A branch of the solitary and only tree found in the desert between Suez and Cairo. Presented by R. V. Thurburn, Esq.

"This tree," observes Mr. Thurburn, "has all the appearance of a very large sized *"babool"* of the common sort in India, but it is completely covered with thorns ; its diameter at the foot is about two feet. This solitary tree is almost adored by the Bedouins and the Hajeas, and is supposed to confer a charm against sickness on any individual who throws a rag upon it ; it was actually covered with thousands of rags at the time I saw it."

Horticultural Exhibition.

A list of native gardeners, to whom prizes to the extent of one silver medal and 89 rupees, were awarded at the second quarterly show of vegetables and fruits, held on the 21st May, was submitted. The following are the remarks appended to the list :—

"Upwards of one hundred mallees were in attendance on this occasion. The baskets were ranged in two rows running the whole length of the Hall. The display of cabbages of sorts was tolerably good, and so was the carrots, turnips, lettuce and beet. The asparagus was exceedingly well grown. The Windsor bean, salsify and parsnip,—for which prizes were offered,—were not forthcoming, while the artichokes were very indifferent, and the radishes overgrown.

The assortment of indigenous vegetables was not so varied as on the last May show, but there were several exceedingly fine ears of maize, which in length, and size of grain, were a near approach to the produce of America. The stock was stated to be derived from Patna seed.

In the fruit department, the peaches, lichees, and grapes took the lead. Several of the former weighed 8 and 9 tolas, while one weighed upwards ten tolahs. The fine bunches of purple and white grapes from Mr. Stalkart's garden at Goosree were much and deservedly admired. A basket of soursops was exhibited for which the owner obtained a fair reward.

Altogether this show, though somewhat limited, may be considered an encouraging one.

Mr. Speede (a member of the Garden Committee) and the Deputy Secretary selected the prize specimens. Mr. William Storm awarded the prizes."

Withdrawal of extra subscription.

A report from the Finance Committee was next read. The Committee suggest the propriety of withdrawing the *extra* subscription of two rupees quarterly, at the close of the present or second quarter, instead of continuing it for another quarter to complete the two years, for which period it was determined originally to extend it. The Committee arrive at this conclusion principally in consequence of there being now a trifling balance in favor of this extra subscription account after payment of the Society's proportion of the debt on the Metcalf Hall.

Resolved,—That the suggestion of the Finance Committee be carried into effect, and the amount of subscription revert to the former sum of eight rupees per quarter, commencing from the 1st proximo.

Resuscitation of the Branch Society and Garden at Berhampore.

A communication from R. F. Hodgson, Esq., announcing the re-establishment of the Branch Society and Garden at Berhampore, was next brought to the notice of the meeting. Mr. Hodgson mentions that a new site close to cantonments has, after some difficulty, been obtained for a garden; the old garden being too far removed from the station to be easy of access. Mr. Hodgson adds, that he has already secured the co-operation of several of the residents of the station, and asks for assistance from the Parent Society in the way of seeds, plants, &c.

Resolved,—That every available aid be accorded to this newly re-established Branch Society.

Communications on various subjects.

The following letters were also submitted :—

1.—From C. Palmer, Esq., Secretary Branch Society, Hooghly, acknowledging receipt of plants and seeds for their public garden. Dr. Palmer adds, "we have within the last few days added considerably to the garden land, and I hope ere long to be able to give you a satisfactory report of our proceedings."

2.—From Dr. C. T. Smith, dated Bangalore, 5th May, asking for a further supply of silk-worms' eggs. "Some years ago," observes Dr. Smith, "I procured through you, from Mr. Blechynden, some eggs of the March Bund annual silk-worm. The produce of which, has thriven well here, though it ceased to be an annual worm. The silk is so very superior to that of the country, that the Mysore Government is doing all in its power to introduce them. For the past year the cocoons have not certainly yielded moths, nor have the moths been so productive as before. I am anxious to get a fresh supply of eggs, and shall feel grateful, if you will cause a supply to be sent of the best sorts."

The Secretary was directed to endeavour to meet this request of Dr. Smith.

3.—From G. A. Bushby, Esq., Secretary to the Government of India, stating that another reference has been made in accordance with the request of the Society, to the Government of Bombay, on the subject of the cotton cleaning machine invented by Mr. Robert Burn.

4.—From Major Jenkins, intimating that he fully approves of the resolution of the last meeting in withholding any reward from Mr. Petrie at present, for his cotton cleaning machine brought to notice by Dr. Wight. Major Jenkins adds, "I hope ere long the Society will possess both the machines [Mr. Burn's and Mr. Petrie's], and put them to the test of experiment—but as I think, if I recollect rightly, (I have not the Society's proceedings to refer to just now) their reward was promised for an improved *churka*, it may not be in the power of the Society to give the promised reward to Mr. Petrie. I should hope however, that if Mr. Burn's instrument prove a failure, or not such as to deserve a prize, Mr. Petrie may obtain it, in case his does the work to a decided advantage, or if approved at all, you may bestow on him a medal.

"I shall be anxious to know the result of your reference to Dr. Wight regarding the cost of Mr. Petrie's gin,—if not very considerable perhaps the Society will commission one through that gentleman, or direct from England for inspection at their museum."

5.—From Raja Sutteechurn Ghosaul, returning his acknowledgments for his election to the office of a Vice-President of the Society.

6.—From Major T. E. A. Napleton, Honorary Secretary Branch Agricultural Society, Bhauglepora, submitting a very satisfactory report of an exhibition of vegetables and fruits, flowers and agricultural produce, held at that station, on the 25th ultimo.

7.—From Lieut. W. H. Parish, dated Loodianah, 23rd May, submitting an interesting communication, regarding the highest elevation at which the plantain can be cultivated, and on a few other subjects.

8.—From Captain G. E. Hollings, dated Lucknow, 18th May, offering to send for the use of the Society a lot of acclimated seeds, the produce of the public garden at that station. Captain Hollings adds ;—"We have a small quantity of grapes and Bombay and other graft mangoes this year ; the strawberries have not been so well flavored, as usual—although of a good size—the peaches and oranges promise well and melons are abundant and of generally good flavor. All the plants received from Dr. Wallich and yourself are flourishing, and I have reason to expect a good increase in the varieties of sugar-cane you kindly sent me. Some of the flowers have been and are still very beautiful."

The Secretary mentioned that he had lost no time in availing himself of Capt. Hollings' obliging offer, and had solicited him likewise to send an assortment for the use of the newly formed garden at Berhampora.

(Thursday, the 15th July, 1847.)

The Hon'ble Sir J. P. Grant, President, in the chair.

The proceedings of the last meeting having been read and confirmed, the gentlemen then proposed were duly elected members of the Society, viz :—

Capt. William Lamb and Baboo Pearychund Mitter.

Candidates for Election.

The names of the following gentlemen were submitted as candidates for election :—

Sullivan Becher, Esq., Civil Service,—proposed by Mr. Bushby, seconded by the Secretary ;

James Stuart, Esq., (Firm of Carr, Tagore and Co.)—proposed by Mr. W. Storm, seconded by the Secretary.

Presentations to Garden and Museum.

1.—An assortment of acclimated seeds of lettuce, artichoke, turnip, cauliflower, and *Ipomea rubro-cerulea*, the produce of the Branch Society's garden at Bhauglepore. *Presented by the Branch Society.*

2.—A quantity of seed of *Mimosa alba* or sweet-scented white babool. *Presented by Major T. E. A. Napleton.*

3.—A supply of sitsaul seed. *Presented by James Pontet, Esq.*

4.—A small assortment of seeds of field produce, consisting of clover, mangul wurzel, mustard, tares, kohlrabi, rape, barley, wheat, flax, hemp, turnip, carrot, and parsnip. *Presented by the Court of Directors and received by the last overland mail.*

5.—A quantity of peach stones from Sydney. *Presented by Capt. A. P. Wall.* (All the above seeds are now ready for distribution.)

6.—A plant of *Hoya mollis*. *Presented by Mr. R. Wood, Junior.*

7.—Three mango grafts of a superior stock, the produce of his garden. *Presented by Rajah Sutteechurn Ghosaul.*

8.—A quantity of pods of a tree very common in the Chittagong hills. *Presented by A. Sconce, Esq.*

Nursery garden—Cane plantation—School for gardeners, &c.

A long report from the garden committee was next read. The Committee allude to the present favorable appearance of the new cane crop. They state that the amount of cane distributed during the past season (1846-47) was forty-four thousand, being larger than that of any previous season, excepting 1841-42, and that the sum realized by the sale has defrayed, within fifty rupees, the total ordinary expenses of the garden for the past year. They add a statement of the distribution of each season during the last 8 years, or since the formation of the nursery, amounting in the aggregate to 202,430 canes which have been introduced into various districts of Bengal and Behar,

while a small proportion has been sent to Cuttack, Arracan, the Tenasserim Coasts, Madras and Ceylon. The Committee report favorably of the fruit tree department. A number of mango graft of the best sorts is now ready for distribution and more are in the course of preparation. They suggest that the distribution be confined for the present to members of the Society, and that a charge of eight annas be made for each graft—and 6, 4 and 2 annas on other grafts, varying according to the kinds required.

The Committee next refer to the flower garden, and suggest an additional small outlay of money for certain improvements. They allude also to the defenceless state of the boundaries of the garden, and suggest a remedy to be commenced on at the beginning of next cold season. The Committee lastly allude "to the propriety of endeavouring to establish, at the nursery, a school for gardeners, to aid in meeting, in due time, the many applications from Mofussil members for men whose services can be better depended on than those who are now sent frequently, and of necessity, on the recommendation of one of their own class ; and that they had instructed the Overseer to make enquiries as to the feasibility of the scheme. They have now the pleasure to submit a communication from Mr. D'Cruze, on the subject, and to suggest its adoption. The outlay for this proposed school will be small, namely, a grant of Rs. 25 for the erection of a school room, and a monthly allowance of Rs. 29. The number to be limited to twelve for the present, to be increased at any future time should the plan prove successful. The Committee have suggested the hiring of *boys* for this school, to avoid encountering the prejudices generally entertained by adults against a system of gardening differing from what they have been accustomed to. They have no wish, however, to exclude from the school any gardener who may be desirous of learning the principles of his art, and to read and write ; but it should be understood that these men will receive only the same rate of wages allowed to the coolies employed by the Society, namely, Rs. 3-3 per mensem, until they are considered sufficiently advanced to be recommended as gardeners to members or others applying for their services. A gardener availing himself of this privilege will be received on the establishment, but without increasing the number now allowed by the Society for the purposes of the garden."

Resolved,—That the report of the Committee be confirmed—but that the formation of the proposed school be delayed for a short period to admit of certain additional information being obtained.

*Further particulars regarding a description of disease affecting the
Potato Crops in various parts of India.*

The Secretary submitted three communications from members of the Society, in continuation of the particulars laid before the last meeting, regarding a description of disease affecting the potato crops in certain parts of the country.

The wild and cultivated Plantain of the Sikim Mountains.

A communication from Dr. Campbell, Superintendent of Darjeeling, regarding the elevation at which the wild and cultivated plantain is found in the Sikim Mountains, was next read.

Valuable Tanning properties of a Tree common to the Jungles of Chittagong.

The subject which next came before the meeting had reference to the pods alluded to in the list of presentations.

The Secretary stated, that they had been sent from Chittagong by Mr. Seonce.

Communications on various subjects.

The following papers and communications were also submitted :—

1.—From Capt. Munro, submitting a long and interesting paper on antidotes to snake-bites, compiled partly from communications made to the Society by Mr. Lowther and Col. Cox, partly from numerous other sources, and also from personal experience. Capt. Munro observes, that he has brought up the information on the subject to the latest period.

The thanks of the Society were accorded to Capt. Munro, and the paper was transferred for publication in the Journal.

2.—From Baboo Pearychund Mitter, Librarian, Calcutta Public Library, stating that the Curators are prepared to participate in the expense (within 300 rupees) of substituting a new column in place of the defective one on the SE. corner of the porch of the Metcalfe Hall ; and requesting the Society to join the Library in payment of at least a portion of the expense of substituting a pukka roof for the present iron one.

It was agreed, that the Society should contribute half of the balance required to make up the deficiency according to the statement furnished to the meeting by a Proprietor of the Library ; and that a suggestion should be made to the Curators that the name of Col. Sage be added, as a representative of the Society, to any committee which may be appointed to superintend the proposed alterations.

3.—From Dr. George Buist, regarding the introduction of windmill power into India for irrigation and other purposes. Dr. Buist remarks, that his arrangements on this subject have altogether become altered since he addressed the Society two years ago. That he now proposes, instead of transferring his paper for the Society's journal, to issue it in the form of a book of folio size, in numbers of 16 pages each, extending altogether to 100 pages, to be completed in about two years ; and asks the Society to become the Agents in the matter ; the amount cost of publication to be defrayed by the sale of the numbers.

Dr. Buist further states, that the models promised to the Society have been some time on his hands, but he has retained them in consequence of the cost having so greatly exceeded the original estimate.

Resolved,—That the Society regrets its inability to meet Dr. Buist's wishes as respects the work above referred to, but will be prepared to reimburse the cost of the stereotype plates, forwarded from England.

4. From R. Pringle, Esq., Chief Secretary to the Government of Bombay, enclosing copy of a letter from the Military Board of that presidency, expressive of its opinion regarding the churka invented by Mr. Robert Burn.

The Secretary was requested to submit this communication again to the Society, on receipt of the machine in question from Bombay, for which a second application has been lately preferred.

5.—From Mr. Landreth, seedsman and florist, Philadelphia, advising despatch from Boston, on 29th April last, per *Jacob Perkins*, of the large consignment of vegetable, flower, and maize seed, ordered last year by the Society. The consignment amounts to 1,112 dollars.

6.—From A. Robertson, Esq., intimating that want of leisure will preclude his undertaking chemical analyses for the Society, as agreed on three years ago.

The Secretary having brought to the notice of the meeting the circumstance of certain gentlemen, not members, having indented on the Society for seeds and plants, by the transfer to them of such privileges by members absent from the country, who have compounded for their subscription, it was proposed by Mr. Staunton, seconded by Capt. Munro, and agreed, that only members actually resident in India shall have claims upon the Society's garden, or seeds imported by the Society.

Col. Sage desired to give the following notice of motion for the next meeting :—

“That the day of meeting of the Society, if not inconvenient to the majority of members, be changed, and fixed for any other day excepting Tuesday and Friday.”

(*Wednesday, the 11th August, 1847.*)

William Storm, Esq., Vice-President in the chair.

The proceedings of the last general meeting were read and confirmed. The gentlemen proposed on that occasion were also duly elected Members of the Society, viz. :—

Sullivan Becher, Esq., C. S., and James Stuart, Esq.

Candidates for Election.

The names of the following gentlemen were submitted as candidates for election :—

Baboo Radanauth Sickdar, chief computer, grand Trigonometrical Survey, —proposed by Baboo Pearychund Mitter, seconded by Baboo Rangopal Ghose ;

Baboo Russick Krishna Mullick, Deputy Collector, Burdwan,—proposed by Baboo R. G. Ghose, seconded by Baboo P. C. Mitter ;

J. F. Harrison, Esq., Secretary India General Steam Navigation Company —proposed by Mr. S. G. T. Heatly, seconded by Mr. Mackilligin ;

Rajah Protabhunder Singh, Zemindar,—proposed by Baboo P. C. Mitter, seconded by Baboo R. G. Ghose ;

Baboo Prannauth Bhose,—proposed by Mr. G. Wood, seconded by Mr. Wale Byrne ;

Baboo Turrucknauth Roy Bahadoor, Principal Sudder Amcen of Maunbhoom,—proposed by Col. Ouseley, seconded by the Secretary ;

Major R. Houghton, Deputy Assistant Adjutant General, Sirhind Division,—proposed by Capt. F. C. Burnett,—seconded by the Secretary ;

R. F. Hodgson, Esq., Civil Service, Berhampore,—proposed by Mr. H. Torrens, seconded by the Secretary.

A. E. Russell, Esq., C. S., Midnapore,—proposed by Mr. H. T. Raikes, seconded by the Secretary ;

John C. Abbot, Esq., of Midnapore,—proposed by Mr. G. U. Adam, seconded by the Secretary.

Baboo 'Neelmoney Bysack, Uncovenanted Assistant Commissioner, 19th Division,—proposed by Baboo P. C. Mitter, seconded by Baboo R. G. Ghose.

Capt. A. Dallas, Assistant Secretary Military Board,—proposed by Col. Sage, seconded by the Secretary.

Baboo Lall Beharee Dutt, Merchant,—proposed by Baboo Cossinauth Dutt, seconded by Baboo Gungadhur Seal.

John Barton, Esq., Merchant,—proposed by Mr. Molly, seconded by the Secretary.

Presentations to Library.

- 1.—Calcutta Journal of Natural History, No. 29. *Presented by Dr. M'Clelland.*
- 2.—Journal of the Royal Asiatic Society of Great Britain, No. 17, Part 2. *Presented by the Society.*
- 3.—Journal of the Asiatic Society of Bengal, Nos. 177 to 183. *Presented by the Society.*
- 4.—An address to the Residents of Maulmain on the subject of extending the rice culture in the Tenasserim Provinces. *Presented by the Writer.*
- 5.—The India Review for October 1843. *Presented by the Proprietor.*

Garden and Museum.

- 1.—An assortment of acclimated vegetable and agricultural seeds from the Lucknow garden. *Presented by Captain G. E. Hollings.*
- 2.—A further supply of vine cuttings, the produce of his garden. *Presented by W. Stalkart, Esq.*
- 3.—Five bottles of acclimated cauliflower seed. *Presented by W. H. Rainey, Esq.*
- 4.—Some melon and grape seed of a particularly good description, from Jeypore. *Presented by J. Cowell, Esq.*
- 5.—A bundle of cuttings of *Paspalum vaginatum*. *Presented by H. Piddington, Esq.*

Mr. Piddington states, that he has lately received this grass from Bermuda : that it is very succulent, of rapid growth, and highly relished by cattle and horses. Mr. Piddington adds,—“ I see by the *Hortus Mauritianus* that it is also a swamp grass, and I should infer it may be of great value in *churs* and the banks of *jheels* here. I shall be glad to supply any persons with cuttings. It grows from every joint, and all I have has been propagated in a few months from two bits saved from a box.”

- 6.—A few skeins of silk in the raw and scoured state, raised in the southern part of the Sandoway district. *Presented by Major Bogle.*

(Further particulars about this silk will be found in the body of the proceedings.)

Postponement of Flower Show.

A suggestion was submitted from the Garden Committee to the effect that the third quarterly flower show, which was held last year in August, be postponed to the latter end of October, on some day to be hereafter named. The Committee recommend this adjournment, in consequence of the former exhi-

bition having proved a very poor one, and the present likely to be as bad, if not inferior, were it held at the same period of the year. By postponing it to October, the Committee are of opinion, that many varieties available for exhibition in August, will also be then in flower, in addition to *dahlias* and other plants which are most in perfection at the beginning of the cold season.

It was proposed by Mr. Henry Alexander, and unanimously agreed, that this recommendation be carried out.

School for Gardeners.

Another recommendation from the Garden Committee embodied in a report submitted at the last meeting respecting the establishment of a school for gardeners, but deferred till the present to admit of certain additional information being obtained, was next brought forward, and unanimously agreed to.

The call upon the funds of the Society, for this school will be only Rs. 29 per mensem, in addition to an outlay of Rs. 25 for the erection of a small bungalow.

Vernacular Hand-Book of Agriculture, Horticulture, and Farming.

The Secretary drew the attention of the Meeting to several copies of Mr. Fenwick's Hand-Book just received from the press; and laid on the table various bills for the printing, lithographing, and binding of the work, amounting in the aggregate to Rs. 937. Whereupon it was agreed, that a charge of Rs. 1-14 per copy (the cost price) be placed on the 200 copies for which Mr. Carre Tucker has applied, and that the remaining 300 be sold at Rs. 2 a copy: the proceeds to be transferred from time to time to Mr. Fenwick, as received by the Society.

Change in the day of Meeting.

The motion of which notice was given by Colonel Sage, at the last Meeting to the effect, "that the day of Meeting of the Society, if not inconvenient to the majority of Members, be changed, and fixed for any other day excepting Tuesday and Friday,"—was withdrawn by the mover in favor of the following amendment by the Secretary:—"That with reference to Col. Sage's attendance at the Society and his official engagements on Wednesday, the day of Meeting be altered, till further notice, to the second Thursday of the month."

The amendment was seconded by Col. Sage, put to the vote, and carried.

Silk from Arracan.

A communication was read from Major Bogle, regarding the specimens of silk referred to above. Major Bogle says, this silk is raised in the southern

part of the Sandoway district, not far from the Burmese town of Bassein. In the Burmese dominions a great deal of silk is produced, and Major Bogle supposes the staple now submitted to be the produce of the Burmese worm. He hopes to obtain fuller information respecting the culture hereafter, but mentions in the meantime—in reference to an inquiry on that particular point—that though he knows not what tree the worm feeds on, he is satisfied it is *not* the mulberry.

The Secretary mentioned that Mr. Laidlay had favored him with a report on these specimens, which he had lost no time in sending to Major Bogle. It is to the following effect :—

“ If this silk had been reeled more carefully, it could without doubt, meet with a very ready sale in England. As it is, it is uneven, and abounds in *gouts* (as they are technically called) which would be very much objected to by the manufacturer. The silk is harsh from being reeled at too high a temperature, and the lustre of the scoured specimen is slightly impaired by the process adopted for the removal of the gum. But the staple is excellent ; and if it can be produced cheap, such a manufacture should be encouraged. The thread would suit the English market better if only half the thickness, or indeed if much less than that ; say 8 to 10 or 12 to 14 cocoons. As no silk of this kind is sent to England, I can give no idea of its value.”

Communications on various subjects.

The following papers and letters were also submitted :—

1.—From Major Jenkins, submitting a second interesting and valuable paper from Major Hannay, regarding the timber trees to be found in the forests near Jeypore, Upper Assam.

2.—From Mr. D'Cruz, gardener to the Society, presenting a practical paper regarding the varieties of sugar-cane in the Society's garden, with a few hints for their cultivation.

These two communications were referred to the Committee of Papers.

3.—From Captain Barr, Secretary to the Agri-Horticultural Society of Bombay, enclosing copies of letters relative to the introduction into Great Britain of a species of Himalayan barley (*Hordeum celeste*), and asking the Society's assistance in procuring a certain quantity of it.

It was suggested and agreed that an application on the subject be made to Dr. Thomson, Surgeon to the Scientific Mission proceeding to Chinese Tartary, and to Dr. Jameson, Superintendent of the Botanic Garden at Saharunpore.

4.—From Capt. G. E. Hollings, advising the despatch of the seeds noted under the head of presentations. Capt. Hollings intimates his intention of

sending shortly to the Society a full report of the operations of the Lucknow garden. "In the meantime"—he adds—"it is gratifying to know, that I have been able to meet all applications for seeds, &c., some of which are destined to be sown at Ferozepore, the Jullunder, and at Lahore!" Capt. Hollings has also obligingly met a request from the Society for the despatch of an assortment of seeds for the newly formed garden at Berhampore.

5.—From Baboo Pearychund Mitter, Librarian, Public Library, intimating that the Curators of the Library intend incurring a larger outlay than the sum noted in his former communication, on account of the proposed pukka roof for the Metcalfe Hall.

Resolved,—That the Society are not prepared to incur further responsibility than that agreed to at the last meeting.

6.—From Dr. Palmer, Secretary to the Branch Society of Hooghly, asking for a supply of plants and seeds for the use of their garden.

The Secretary intimated that this request had been complied with.

7.—From Messrs. Villet and Son, Cape of Good Hope, advising the despatch of a large consignment of vegetable seeds for the Society, amounting to Rs. 1,648.

These seeds are now in course of distribution.

8.—From Dr. McClelland, giving in reply to Secretary's letter, a few particulars regarding the cultivation of *Vanilla aromatica* in the H. C. Botanic Garden.

It was agreed, that the Society indent for a few plants of *Vanilla* from Mauritius for experiment in its nursery garden.

9.—From Dr. Robert Wight, dated Coimbatore, 1st July, affording some further information about Mr. Petrie's improved cotton cleaning machine.

10.—From Dr. Campbell and Mr. Henley, furnishing some interesting particulars regarding the Kunchoorra fibre of Rungpore.

Correspondence and Selections.

COTTON CULTURE AT OMEGHUR, NEAR AGRA: AN IMPROVED MACHINE FOR DIVESTING THE WOOL FROM THE SEED. .

Extract of a letter from H. HAMILTON BELL, Esq., dated from Omeghur, near Agra, October 29th, 1847.

The Government of the N. W. Provinces is taking a very warm interest in the cotton question, and cordially exerting itself to render this country the source of supply of an article forming the raw material of our greatest home manufacture. The very imperfect condition in which cotton is brought to market is almost as objectionable as its inferior quality, and the improvement of the latter is scarcely more necessary than to render the article fairly merchantable.

Whilst providing from all parts of the country the seed of cottons of high repute in the native markets, and which have been approved in England, and endeavouring to substitute these for the very inferior qualities grown in the Doab, the difficulty of preparation suitably for the home market still remains, and engages the attention of Government, who have been pleased to entrust to me the management of the cotton experiment now in progress. To attain the latter object, the only plan appears to me to be to take the *kupas*, or unseeded cotton, from the *Kisans*; but this necessitates machinery for freeing it from the seed, the native *churka* being very imperfect, and of little capability; whilst picking by the hand is tedious and expensive. The American saw-gin has now been a failure, and we must seek other resources.

Mr. J. H. Mather, who has made some improvements on a *churka* of the late Mr. Potter, the experiments on which, before a committee appointed by Government to report on the improved machine, have led to his being deputed to Calcutta to make up a sufficient number for the application of other motive power than manual labor, will probably call at the Society's rooms to inspect any machinery that may there be met with, and may seem likely to answer either of the objects in view; and I venture to recommend this gentleman, who is, I

believe, of considerable scientific acquirements, to your obliging attention in the enquiries he may be solicitous to make. I mention Mr. Mather's name at his desire, but I am quite satisfied nothing of the kind is required to insure your assistance in any matter of such great public interest as the business in which he is engaged.

REPORT ON THE PRESENT STATE OF THE PUBLIC GARDEN AT
LUCKNOW. COMMUNICATED BY CAPT. G. E. HOLLINGS.

I have the pleasure to enclose a list of the prizes given at the show of fruits, flowers, and vegetables, held at the Residency Banqueting Rooms this day, which, judging from the opinions of those who kindly attended, afforded great satisfaction, and I have now reason to suppose, that we have really attained some of the objects contemplated when the public garden was originally established, and that hereafter our success will equal our most sanguine expectations. The accompanying statement of our expenses, and the means by which the garden has been maintained, without requiring extraneous assistance of any kind, will prove that I have succeeded in showing that it can support itself; and it is but reasonable to suppose that its resources will rapidly increase, because, notwithstanding a considerable failure in the more valuable fruits, the sale of which afforded the principal source of income, and some heavy expenses resulting from the effects of the severe storm in September 1846, the amount realized by the sale of products in 1847, exceeds that of either of the two preceding years by more than three hundred rupees, whilst the sum drawn from the treasury does not exceed the amount regularly contributed by the King of Oude, the yearly subscriptions of our subscribers, and the interest of the money vested in public securities. The balance sheet shows an available surplus of more than five hundred rupees. I have therefore the pleasing satisfaction of knowing that, notwithstanding the many disadvantages under which I have labored, I have been an useful instrument in promoting a great public cause, by showing, that those who are so inclined, may contribute to the development of the riches contained in the soil, without involving themselves in any extraordinary expense, and whilst they

are themselves engaged in a most delightful and interesting pursuit, may contribute to the comfort, happiness, and prosperity of those around them.

I am much in arrears in acknowledging the receipt^d of different parcels containing seeds, which you were good enough to send, but I am convinced that you will not attribute it to a feeling of indifference. I will however, endeavour to make up for the deficiency, by communicating the degree of success that has attended my efforts to cultivate them here.

The enclosed statement will show what has been done. It was submitted to the subscribers to the Agri-Horticultural Society at Lucknow, with the accounts made up to the 31st December, 1847.

I trust that your kind friend, who sent me a supply of silk-worms' eggs last year, will repeat his favor, for although to all appearance the ones I saved are in good order, I should like to have a large supply from Bengal. I have had a reeling machine constructed from the drawing of the one used at Lyons, in Ure's Dictionary of the Arts, which promises to answer remarkably well; and I feel convinced, that if in other respects the experiment succeeds, there will be no fault found with the reeling this year. I am having a machine constructed for cleaning cotton, which will, I hope, be an improvement on that at present in use, and with the assistance of the excellent workmen employed as carpenters at the Residency, I do not despair of succeeding in having an efficient *churka* made up. I have tried a simple arrangement for a churn, which, if successful, will prove very useful to the natives.

I was greatly disappointed at finding that the Governor General could not pay a visit to our garden during his stay at Lucknow, because, if he had shown the slightest interest in our experiments, it would have convinced the native society, that our labors were usefully directed and appreciated by the Government.

It is gratifying to know that public gardens are being established in all the principal zillahs in the Upper Provinces, under the auspices of the Magistrates, and it always affords me the greatest pleasure to be able to afford any assistance that may be in my power. I regret to say that none of the acorns you so kindly sent to me, and which were presented to the Society by Mr. F. W. Russell, have

germinated. The few seeds of black rye* which you sent to me in a letter are prospering, and I can say the same, with one exception, of the small supply of grains you first sent: the last supply of grains from the Court of Directors will not, I am afraid, succeed so well as could be wished, it did not reach me till nearly a month after our rubbee crops had been sown, and were well above the ground.

P. S.—The despatch of my letter having been unavoidably delayed, I have an opportunity of mentioning that I have succeeded in raising in a forcing frame a well flavored melon from the Egyptian seed; and that the first of the silk-worms broke through the egg this morning.

*To the Subscribers to the Agricultural and Horticultural Society,
Lucknow.*

DEAR GENTLEMEN,—Being desirous that you should be acquainted with the state of the pecuniary prospects of the Char Bagh, I have the pleasure to submit for your examination and consideration the accounts from the 1st January 1845 to the present date.† You will, I trust, find the following points established.

1st. That the garden, with the assistance derived from His Majesty, the interest of Company's Paper, and contributions of subscribers, has maintained itself.

2nd. That on the 1st December 1847, there were different sums due to the garden, amounting in the aggregate to Rs. 738-4-10, whilst the liabilities included in the balance due by the garden in the monthly account for December were only Rs. 210-15-2½, showing a surplus of Rs. 527-5-7½ in favor of the garden: it is therefore clear, that since I have had charge of the Char Bagh, its permanent funds have not been in any way reduced. You can all say if there is any improvement in the system of agriculture, and the quality and value of the products, and whether affairs are managed generally as they ought to be. You will not fail to remark, that there is an average

* These are the seeds that were sent from England by Mr. Lautour, and are alluded to in the proceedings for October, page 44.—Eds.

† It is considered unnecessary to publish the monthly details, as the yearly abstract, also furnished by Capt. Hollings, gives a clear insight of the disbursements for the garden, and the amount received by sale of produce.—Eds.

decrease of more than fifty rupees a month in the expenditure, whilst in comparison with 1845 and 1846, the amount realized by the sale of products has much increased, which could hardly have been expected after the failure during the last season of fruits, from which the principal part of the income of the garden has hitherto been derived.

As I have managed to overcome all difficulties, and to make some progress towards the attainment of the object contemplated in the establishment of a public garden, namely, the cultivation in the first instance within the garden of new kinds of products, and their eventual dissemination throughout Oude, it is not unreasonable to suppose that in future the income will regularly exceed the expenditure, and if it should be considered desirable, a small sum could be added annually to the permanent funds of the society, until the amount originally subscribed was vested in Government Securities.

Of the new products that have been introduced since the commencement of 1845, I should like you to examine,—when you are inclined to visit the garden,—the plantations of the silk-worm mulberry, the *Morus multicaulis*; the Dividivi or American *Sumach* used in tanning; the different varieties of sugar-cane, the American and Lahore cotton plants, Madras and Dacca plantains, leeches and other fruit trees received from Calcutta, various kinds of yams and potatoes, and the splendid assortment of flowering shrubs sent to us from Calcutta by the Secretary of the Agricultural and Horticultural Society and Dr. Wallich, and by Major Napleton from Bhaugulpoor. You will also find an excellent specimen of the *Ipomea*, grown from some seeds forwarded to me by Mr. Hume.

The forest trees originally planted in the garden, amongst which are the teak, toon, sissoo and mahogany, are all thriving. Due attention is paid to the cultivation of vegetables, as you may have observed from the specimens, especially those of celery, carrots, beet-root, and endive, exhibited at the show this morning, produced from English, American, and Cape seeds, sent to me by the Society in Calcutta, or received direct by me by the overland route from Messrs. Carter and Co. The collection of flowers is far more extensive than has, I believe, ever been made in Upper India, including varieties of geraniums from Major Napleton and Captain Kirk's garden at Mussooree. Amongst

the fruit trees, there are not only several new plantations of seedling and graft mangoes, an extensive increase to the number of loquats, peaches, *alloobokhara*, vines, custard apples, pomegranates, oranges, limes, &c. &c. &c. varieties of guavas and tamarinds, large beds of strawberries, and new kinds of plantains, but a considerable number of new grafts of every kind, some of which I hope will produce excellent fruits: the ones from which I anticipate the most advantage are the orange on the pomegranate; the *aloo-chin* (small plum,) on the *alloobokhara* and peach; the apple on the *buyere*; the nectarine and China peach on the *alloobokhara*; the pear on the guava, and the strawberry-guava on the common guava. I purpose trying experiments in grafting vines on each other, and the red, or what is generally known as the West Indian tamarind, on the common one. I have tried mulberries of different kinds, but have not yet seen the result.

In my own garden I can show you successful attempts at obtaining flower plants from cuttings of the *ipomea*, *dahlia*, different kinds of *verbena*, *geraniums*, *carnations*, *double pinks*, *heliotrope*, &c. &c.; and in the Char Bagh you can see how extensively the varieties of the passion-flower—purple, pink, white, and deep-red—have been propagated, as also different kinds of perennial creepers from the Cape, Hills, &c. &c. &c.

I have to attract your attention to the cultivation of the cereal grains, as I feel confident that you will not see finer crops of wheat, barley, oats, and gram than in your public garden, and I trust that although some of the seeds received by the Society in Calcutta from the Hon'ble Court of Directors, and forwarded to me, reached this rather late for the proper season of sowing, we shall be able to obtain a sufficient quantity of seed for general distribution next year.

I confidently hope, that you will be pleased and satisfied with my endeavours to carry out the objects for the attainment of which the garden was given to us by His Majesty the King of Oude, and it is gratifying to me to be able to inform you, that all the plants that have been sent from this to different stations, have reached their destination in excellent order.

In conclusion, I venture to recommend, that as no portion of the rewards given at the different shows have for sometime been taken

from the funds of the garden, they should, in future, be left to the management of those who so liberally contribute to them. I will, if you wish, circulate a proposal for subscriptions for the whole year, and when the amount to be given is ascertained, I will ask the contributors to fix on the dates on which the exhibitions are to take place, and the articles for the best specimens of which prizes are to be given. A committee appointed by the subscribers will be easily able to fix the amount of the different rewards.

G. E. HOLLINGS, *Captain,*

31st December, 1847.

Manager of the L. A. H. S.

ABSTRACT.	1845.	1846.	1847.
Drawn from the Treasury, &c.	2,445 2 10	2,352 10 9	1,552 0 0
Sale of Produce,	2,137 10 2½	2,133 5 11½	2,459 1 7½
Amount received from cultivators,	460 0 0	311 9 0	307 4 0
Total,	5,042 13 0½	4,797 9 8½	4,318 5 7½
Amount expended,	5,166 15 9½	4,756 12 1½	4,198 2 3½
Average monthly sale of products,	178 2 2½	177 9 11¾	204 14 9½
Average monthly expenses, ..	430 9 3¾	396 6 4	349 13 6½

The purchase of cattle, buildings, repairs of wells, compound walls, and preparing wells, &c. are included under the head of sundry expenses. .	Sundry expenses, 1845,	901 6 9
	Ditto ditto, 1846, .. .	363 14 0
	Ditto ditto, 1847,	429 10 4
	Total, Rs.	1,694 15 1

[As the detailed list submitted by Capt. Hollings would occupy more space than can be conveniently spared, it may suffice to mention that the amount of prizes awarded for vegetables, fruits and flowers, aggregated Rs. 125-8.

In the vegetable department prizes to the extent of Rs. 66-8 were given for best specimens of cauliflower, brocoli, cabbage, nolo-kole, peas, beans, potatoes, artichokes, turnips, carrots, beet, radish, yams, tomatoes, onions, leeks, spinach, squash, celery, lettuce, asparagus, endive, parsley, salsafy, chilly, capsicum, &c. In the fruit department, to the amount of Rs. 16-8, for citron, pumplenose, orange, sweet-lime, lemon, plantains, &c.

In the list of flowers were, violets, geraniums, heartsease, larkspur, sweet-william, wall-flower, lupins, zinnias, pinks, sweet-peas, narcissus, stock, dahlias, portulacas, candytuft, ipomœas, verbenas, euphorbias, carnation, mignonette, fuschia, honeysuckle, creepers of sorts : for these, prizes amounting to Rs. 42-8 were awarded.

The gardeners of Col. Richmond, Major Scott, Col. Wilcox, Capt. Hollings, Dr. Login, Lieut. Bird, Capt. Lamb, and a few others, were the successful candidates.—Eds.]

PROPOSAL FOR THE INTRODUCTION INTO IRELAND OF A SPECIES OF HIMALAYAN BARLEY. COMMUNICATED BY THE AGRI-HORTICULTURAL SOCIETY OF BOMBAY.

TO JAMES HUME, ESQ., *Secretary to the Agri-Horticultural Society of India, Calcutta.*

SIR,—In forwarding the accompanying copies of letters received from England, I am directed by the General Committee of the Agri-Horticultural Society of Western India, to request you will have the kindness, if possible, to procure the seed therein alluded to, by asking some of your correspondents on the *Sutlej* to interest themselves in the matter.

I am further directed to say, that any expense that may be incurred in obtaining the seed, our Society will be most happy to defray, and will, at the same time, be most thankful to you for the trouble and time you may kindly devote to this purpose.

Agri-Horticultural Society's Office, H. BARR, Captain,
Town Hall, Bombay : 29th July, 1847. Secretary to the Society.

TO ROBERT MCKIMM, ESQ., &c. &c.

DEAR SIR,—You were so kind as to promise me to give assistance, with some of your friends at Bombay, for the purpose of obtaining from *Rampoor*, on the *Sutledge*, some of the *Hordeum celeste*, a species of *Ooa* or *Jow* seed, which grows on the Himalaya mountains. My object in endeavouring to obtain this seed is to facilitate the benevolent wishes of a friend of mine in Ireland, who is very anxious to obtain it, with a view to prevent, in some measure, a recurrence of the distresses in that unfortunate country.

Annexed is a printed letter, which has been published in the Irish newspapers, by the gentleman alluded to above, explaining the properties of the seed in question, and shall be greatly obliged, if twelve or fourteen pounds of it, can be procured through any of your friends.

10, Moorgate Street, London : (Signed) JAMES CHILD.
12th April, 1847.

To the Editor of the Evening Mail.

SIR,—As it is now, I think, generally conceded that the potato can never again be relied on as the staple food of the Irish people, it becomes the duty of every man, who may be in possession of information, not generally accessible to others, to put it forward, if it all affords a chance of supplying, even in part, an efficient substitute for that root.

This is particularly imperative upon those, who recollect that a failure in the wheat crop for several successive seasons, had, within the last ten years, induced many experienced farmers to believe that they might be compelled to give up its cultivation. Without further premise, I proceed to state the object of this letter.

I had once, many years ago, an opportunity of visiting the very remote districts, lying some hundreds of miles, north of the great Himalaya chain, and on the boundaries of the Chinese empire. I found growing there, in great luxuriance, a species of grain, which, although no agriculturist, I think I may venture to assert, might be, with great advantage, cultivated in this country. It was a species of barley, and, I believe, is known to scientific men by the name of *Hordeum celeste*, probably from its being principally grown in the celestial* empire, where I found it.

As a crop, it stood more thickly on the ground than any wheat I have ever seen in any country. The head or ear was shorter, but much fuller than the wheat-ear; and when the grain was ground into

* "The epithet of "Celestial," may have been given to this barley, from the fact of its being grown, chiefly in the chain of mountains which is distinguished from the other ranges by the native term "Kailas," which signifies heaven. I mention this as a means of identification, as several species of "Ooa" or "Jow," barley, are grown in the Himalaya."

mill, we preferred it to any other we met in the course of a very extended journey, as both Europeans and Natives considered it as more palatable and more wholesome than even wheat.

The soil in which it grew was the high poor land, usually grazed by sheep and small black cattle, which extends for many hundreds of miles to the north of the great range.

The grain grew and flourished, as I have ascribed, in this poor soil at an elevation of from 9 to 11 thousand feet above the level of the sea; alongside it was growing the Tartary oat, also in great luxuriance; but the barley was more advanced towards ripeness by at least ten or fourteen days.

In many places the land was stony and gravelly, frequently the mere detritus left by the mountain streams; yet healthier or more abundant crops I never saw than both the grains I have mentioned in that bleak, sterile, and totally unsheltered region.

It will be necessary for me to state, that the elevation at which the *Hordeum celeste* grew, 10,000 feet, gives, allowing 300 feet of elevation to be equal to one degree, at least a latitude of 30 degrees, which, added to that of the place where I found it— $32^{\circ} 30'$ —will show that it might be expected to grow in a latitude of 63 or 64 degrees—very far north of the north-coast of Ireland. This fact, in connection with that of its being apparently a hardier plant than the Tartary, induces me to believe, that it would flourish in the high, bare, and unsheltered mountain-tracts which abound in this country.

I have only to add, that my native servants, who lived almost exclusively on grain, preferred it to any other they had ever met with. There now remains the question of how it is to be procured. It is obviously too late for the present year. Any of the great houses trading to the East Indies, could easily obtain it, by employing an agent at the great fair held at Rampoor, on the Sutlej, to which traders resort from all parts of India. That city is placed on the direct tract from the plains to the high districts of Kannawur, or Luddak, where the grain abounds.

I attempted to bring it to this country myself, but during my illness, and while I was unable to look to any thing, the grain was, unfortunately, placed in the hold of an Indiaman, and, as might

naturally have been expected, lost its vegetating powers from the combined influence of heat and damp, during the voyage.

I have nothing more to add upon this subject, but that, at all events, the experiment of naturalizing the grain would be worth the attempt; and that should it be made, I hope most sincerely that the result may prove as beneficial as I anticipate.

VIATOR.

[On receipt of the above letter of Capt. Barr, the Secretary addressed Dr. Thomson, Surgeon to the Scientific Mission proceeding to Chinese Tartary, on the subject; also Dr. Jameson, Supt. H. E. Botanic Garden, N. W. P. The latter gentleman writes, that he has lost no time in taking steps to meet the wishes of the Society. Dr. Campbell, the Supt. of Darjeeling, has also most obligingly sent a quantity of a description of Tibetan grain, with a communication descriptive thereof, of which the following is an extract.—Eds.]

“A few days ago I despatched to your address by dāk banghy, a parcel containing a seer and a half of barley. Will the Society do me the favor to forward it to Capt. Barr, the Secretary to the Bombay Agricultural Society, with reference to his application for some of the “Celestial barley” of Thibet, noted in the last month’s proceedings of your Society.

“The barley now sent to you is a Thibetan grain, grown near Darjeeling. It is a very fine grain indeed, being remarkable for the thinness of its husk and the size of the grain: this applies to it generally as grown in Thibet and Sikim, for the actual specimen forwarded is not an average one by any means, although the only one I could procure at this time. I hope shortly to send you a sample from which Captain Barr can more correctly judge of the value of the grain, but it may suit his purpose to sow this one, as the real character of the grain may be developed in the produce, although it would be more desirable to have an average sample of seed for the experiment. This barley is known in Nepal by the name of “Ooah.”* It is brought to Cathmandu by the Thibetans from beyond the snows, but it is also grown on this side of the snowy range, in the tract known as the Upper Cachar. It is of a bluish

* This is a “Newari” word I believe.

tinge, as large as English wheat, and much cultivated by the Thibetans, who make the meal into bread, and use it dry with cold water, as the *suttoo* is eaten in India. The Thibetan name is "Na," whether it is the "*Hordeum caeleste*" or another variety, I have no means of ascertaining. It is grown in all parts of Eastern Thibet, and in Sikim it flourishes at all elevations, from 5,000 feet to those at the foot of the perpetual snows; where, however, the summer heat is considerable, and the progress of vegetation more rapid than in the tropics."

Darjeeling, 9th September, 1847.

REPORT OF A HORTICULTURAL EXHIBITION, HELD AT BHAUGLEPORE,
ON 3RD DECEMBER, 1847.

(Communicated by Major T. E. A. NAPLETON, *Honorary Secretary*
Branch Agri-Horticultural Society.)

The first show of flowers, fruits, and vegetables for the season 1847-48, was held in the Society's show rooms, on Friday afternoon, the 3rd December, and was exceedingly well attended both by the European and Native community. Mrs. Campbell, Mrs. Watson, and Mrs. Pontet most obligingly consented to test the specimens in the floricultural department.

Mr. G. F. Brown, Dr. Grant, and Mr. De Verinne, were good enough to act as umpires in the vegetable department. Before the competition for prizes was proceeded with, the committee just named inspected the vegetable produce of the public garden, which consisted of three baskets of very fine peas (including the famous sugar-pea), a large basket of very fine new potatoes, raised from the acclimated Darjeeling seed. Two baskets of red and white pole-kole, a dallee of splendid cauliflowers, also of turnips, carrots, endive, lettuce, beet-root, onions, leeks, Tenasserim yams, Cabool capsicums, Windsor and French beans, nonpareil cabbage, turnip-radishes, West India arrowroot, Jerusalem artichokes, love-apples, &c.—and in the fruit department—citrons, shaddockes, plantains, sweet limes, &c., and pronounced the whole of the above-named produce to be unusually fine for this season of the year, and highly satisfactory.

The Honorary Secretary then brought to notice, that one Baboo Muddun Mohun Mitter, had been wonderfully successful in the cultivation of cauliflowers this season, having cut several very fine ones on the 1st November, and continued to do so ever since. The Baboo accomplished this by placing a palm leaf (erected as a *chattah*) over each plant during the rainy season.

A prize was awarded to the Baboo's gardener.

[Prizes were also awarded to eleven mallees in the vegetable department, for best specimens of cauliflowers, cucumbers, peas, cabbages, radishes, turnips, beet-root, lettuce, potatoes, carrots, nolo-kole, capsicums, chillies, horse-radish, French beans, yams, tomatoes, and indigenous vegetables of sorts.]

[Prizes were awarded to five mallees for best specimens of flowers, consisting of verbenas of sorts, geraniums, zinnias, dahlias, roses, nolas, asystasias, petunias, lavender, pinks, mignonette.]

There were some beautiful bouquets (cut from the public garden) on the tables, among which were dahlias. The *Strelitzia regina*, scarlet and other verbenas, tecomas, *Salvia splendens*, asystasias, geraniums, roses of 6 sorts, fine zinnias, lantanas, honeysuckles, mignonette, *cum multis aliis*.

No prizes were awarded for fruits, owing to the evening being too far advanced to admit of the judges to examine the dallee or adjudge prizes.

It is worthy of notice, however, that several branches of Java coffee plants, with ripe berries on them, were brought to the show from the garden of John Glass, Esq., also a splendid pineapple.

The following is a list of New Subscribers to our Branch Society since our last show on the 26th May, 1847.

F. Harley, Esq.; Lieut. R. Campbell, 47th N. I.; G. G. Balfour Esq., C. S.; Maharaja Roodur Sing, Bahadoor; Baboo Basdeo Sing; John Taylor, Esq.; Captain William Henry Ryves, Commandant 17th Irregular Cavalry; Edward Deedes, Esq., C. S.; H. C. Tucker, Esq., C. S.; G. C. Fletcher, Esq., C. S.; F. C. Fowle, Esq., C. S.; E. S. Pearson, Esq., C. S.; R. Cunliffe, Esq., C. S.; H. W. Tytler, Esq., Civil Surgeon; William Muir, Esq., C. S.; E. R. Morton, Esq.; H. C. Raikes, Esq., C. S.; J. P. Caulfield, Esq.; Moulvee Hafiz Surfaraz Ullec; P. P. Carter, Esq.; Jean de Meiss, Esq. (since dead); W. Daunt, Esq.; Thomas Slade, Esq.; William Daires, Esq.; Moonshee Benecpershaud; Baboo Luchmenarain; J. MacLeod, Esq.; J. Brae, Esq.; W. R. Chill, Esq.; Quazee Uckbur Ullec.

ON HYBRIDIZATION AMONGST VEGETABLES. BY THE HON. AND VERY
REV. WILLIAM HERBERT, LL.D., F.H.S., DEAN OF MANCHESTER.*

I have mentioned that different species of *Zephyranthes* did not intermix willingly, but seedlings of *Z. tubispatha* by *Z. carinata* flowered at Spofforth, which produced no seed, and have been lost since. One was raised from *Z. sessillis* var. *Guatimalensis* by *carinata*, which has borne seed and fertilized var. *verecunda*. The dust of *H. concolor* and other species of *Zephyranthes* and *Habranthus*, and of *Sprekelia formosissima* and *cinnabarina*, has been very frequently applied to *Hippeastrum*, but always in vain. *Hippeastrum*, however, both here and in America, has willingly produced seedlings by the

curious plant figured as *Sprekelia cylister*, and supposed by me to form a second section of *Sprekelia*, differing in the relative length of its several stamens and in the *Hippeastrum*-like breadth of its leaves. Professor Lindley was therefore right in looking upon it as an anomalous *Hippeastrum*; and I think it gives reason to believe that *Sprekelia* is rather a very strongly marked section of *Hippeastrum* approximating to *H. aulicum* than a genus *originally* distinct; in which case the question would be yet open, whether, under very favorable circumstances, a cross might not be still obtained, for no *Sprekelia* seems willing to bear seed in our climate and under our cultivation.

The genus *Crinum* goes round the belt of the world not exceeding a certain distance from the equator. A portion of it was originally included in the genus *Amaryllis*, being supposed to conform with the *Belladonna* lily, on which it was founded. The greater part of that portion breed as willingly with those within the old Linnæan limitation of *crinum* as with each other; but those from the west coast of Africa (although one of them, *C. spectabile*, is naturalized in Brazil) usually fail to breed with any other species. One of them, however, *C. Broussonetianum*, comes so near to the East Indian species, that Mr. Ker united it with them as a variety under the name *Amaryllis ornata*. I raised after repeated failures one seedling from *C. Capense* by pollen of *C. spectabile*, as I believe, but I lost the plant when two years old, before I could feel certain of its correctness. Here is one of the unintelligible freaks of nature; that is to say, one of the departures from analogy in the dispositions of the All-wise, of which I at least cannot fathom either the cause or the mode.

The genus *Crocus*, with great uniformity of aspect, branches into an infinity of species and local varieties, being found in peculiar situations and soil, but with greater similarity of habits and constitution than *Crinum*; and it might have been supposed that, when brought into cultivation, their seminal produce would become confounded. On the contrary, I have tried in vain for years to obtain any cross; I have not one as yet on which I depend; and, if I have any, not above three or four such bulbs, and about as many seeds. The cross-impregnation seldom produced a pod, and, if it did, the seed was usually shrivelled and bad. Look at the geological map of Dory St. Vincent. Half the island of Milo consists of igneous rock, half of marble and schist. On the schist he found *C. lavigatus*. The same schist appear in Thermia; *C. lavigatus* is there. I know that it passes thence to Hymettus and to the neighbourhood of the quarantine station at Zeitun. I doubt not that a like calcareous formation will be found there. But why does *C. lavigatus* jump from the summit of Milo to the summit of Thermia, and thence by Hymettus to Zeitun, without touching the hills of Epidaurus or Nauplia, or any part of the Moræa, as far as it has been searched? I believe because the soil, subsoil, and climate, in which it grows, have forced *Crocus* to take

that form and aspect which botanists call *C. lavigatus*, not that it has a predilection for such, for experience leads me to think, that few local bulbs or even plants prefer their native soil, though they are found in it because they can endure it, while the rivals, which would otherwise oppress them, cannot thrive vigorously in it. Many such are found to perish if potted or cultivated in their native soil removed to another situation, finding either an injurious increase or diminution of moisture in the new position, which makes a different soil expedient for them there. *Griffinia* grows in mountain woods in very strong loam; it will scarcely live in such soil in our stoves, where it seems to like sandy peat. *Ismene Amancaes* grows in Bolivia in loam, strong enough to break an iron crow; here it must be cultivated in pure white sand. I find such European Orchideæ and Croci as grow in chalky or calcareous stuff, very much disposed to canker and die if potted in the like, while the fresh tubers and corms of almost every kind turn out well from a yellowish crumbling loam of moderate tenacity. No *Crocus* grows naturally in alluvial soil, probably because other plants would there smother it; but many, if not all, delight in it in a sufficiently dry situation, when cultivated. Different soils, therefore, suit the same vegetable under different circumstances, because in different positions they will have to contend with other difficulties and other rivals for the occupation of the soil. I consider a due quantity of moisture, without excess or deficiency, to be the main requisite to every plant which has peculiar local affections, premising that it must have space, unincumbered by stronger rivals that would overpower it, and a suitable temperature. I have found a blue *Statice* growing aloft in solid stone at the back of Portland island, and elsewhere on the brink of a runnel in a saltmarsh; I have found *Gentiana verna* on the firm turfy brow of the St. Gothard, and in the flooded marshes at the head of the lake of Thun. The clouds and the sea-spray and fog furnished in the high position that incessant moisture which those plants demanded, and which the rival grasses found to be superabundant for their use and injurious to their vigorous growth.

To return to *C. lavigatus*: one of two views must be adopted, either that schist, in a position where it receives a certain degree of moisture under a certain temperature, is essential to enable a variation of the genus *Crocus*, which originated in such a position to reproduce and maintain itself against all intrusion, or that the like data tend to produce a similar variation in different insulated spots; but it is not easy to suggest a satisfactory reason why such an indisposition to intermix should exist in a genus which branches into so many local species with so much general conformity both of habit and aspect. It has sometimes occurred to me, that the variations produced by circumstances of poverty, where the plant exists by superior powers of endurance, become more fixed than those which arise from luxuriance. *Crocus* seems to me to live in a state of constant mountain warfare, avoiding the presence of powerful rivals; *Narcissi* shoot both early and vigorously, and

usually domineer over the grasses, &c., in the position they choose. The attempt to cross *Crocus vernus* with other species led to some interesting observations. Plants thereof were taken up and potted at the flowering season for that purpose. I found that no excision, however deep, of a flower that had expanded itself, and of which the pollen was set free before it was taken up, could prevent the underground germen within the sheaths of the plant from perfecting its seed in due time. The fertilization had taken place and could not be arrested. On the other hand, no application of its own pollen would fertilize a flower after the transplantation; the check received prevented the fertilization; prevented, as I believe, the plant from supplying that which the pollen required to enable it to elongate its tubes. But a further remarkable circumstance was observed. The roots so potted were plunged in a sand-bed, that they might be ready for the next year's operation without transplantation; but two seasons succeeded, and those roots produced no flower. A small bulb of a variety of *C. vernus* from the Splugen had been also potted two years, and did not flower. It was planted out, and no longer failed. What does this imply? I suspect that the relative cold and moisture of the crown and the base or fibres of a plant is an important point which cultivators have overlooked, and which may be one of the agents by which local variations have been produced. *C. vernus* on the Alps, at an elevation of 5,000 feet, frequently flowers by piercing the yet unmelted remnant of snow. In that position its head is wet and very cold, while its tail descends to the warmer and drier stone. In a pot at my window the vernal sun warms its head, while the pot detains the wet round its fibres and the evaporation from the pot chills them. The relative circumstances are therefore reversed. When I find that *Crocus vernus* does not descend below 5,000 feet on the mountains of the South of Italy, and that its near kin *C. Imperatorius* flourishes there between 2,000 and 3,000 feet above the sea, I cannot avoid suspecting that the variation was worked in times by-gone by the difference of position, and I ask myself whether the different relative moisture and warmth of the two extremities of the plants, and not the mere difference of soil and temperature, caused their diversity, and now prevent their juices from co-operating for mutual fertilization.

I will now turn to the genus *Colchicum*, not because I have raised crosses therein, which I have not tried, but because it well exemplifies the confusion of ideas that exists on this subject amongst botanists,* both as to facts and theory. *Colchicum* with great general similarity varies infinitely not only in different localities, but even in the proportions of the several flowers of

* I wish to take this opportunity of doing justice to my scientific friend Dr. Brown, having stated incorrectly, *Amar. Pr. Tr.*, p. 5, that the germen growing below or above the flower was undetermined in his order *Asphodelæ*. I overlooked the word by which he indicated it, from its being misplaced, on comparing the definition with that of a cognate order.

the same plant. The natural consequence is, that many species have been described, insufficiently defined, and not easily determined, to which my own collections can make a considerable addition. A strong feature of difference is size ; the bulb or corm of some being large, and the leaves wide and a foot long, while in others the bulb is small, and in one species the leaves almost filiform. Consequently, in R. and Sch. Syst. we find very long dissertations on the question of the identity or difference of several species of this genus, and Professor Bertoloni (Amœn.) refers a lot of them, great and small, to *Colchicum autumnale*, saying the difference is in proportion of parts, the smaller being from a more arid situation, and that it flowers earlier on account of the colder climate in which it dwells ; meaning, I suppose, where the autumnal rains are earlier. There seems to be a disposition to accept this as sound reasoning ; but what does he mean ? I believe neither he nor those who would accept it know exactly what they assume. Does he fancy that the small forms are peculiar to dry and cold situations ? I can assert that the fact is not so. I have found one of the very largest (which I propose to call *C. pulchrum*) on a high mountain in Cephalonia, very near to the small *C. Bertolonium* and other diminutive kinds, and I have found small kinds not much above the sea level in Corfu. Does he mean that the small sorts, in which he sees some affinity to *C. autumnale*, will acquire the stature and proportions of *C. autumnale* when removed into the soil and climate in which it is found ? The fact is not so ; the small forms remain unchanged in cultivation. Does he fancy that the mean temperature of the southern hills, on which the small forms are found, is colder than the meadows of Yorkshire, in which the larger *autumnale* grows ? The reverse is the case. Upon what principle then is it asserted that some forms, permanently very different, are of one individual species, and others in the same genus of several species, because they differ in having the margins of the leaf more or less parallel, or the stigmas straight or bent, and so forth ? There is nothing rational in this ; and yet the whole science of botany lies under that cloud. The true fact is, that *Colchicum* is one created type ; that it has branched in by-gone ages into various forms, through various circumstances of climate, soil, subsoil, and altitude, and the altered features have become durable. In the subdivision of this genus or kind into existing species or permanent forms, the botanist has to consider, and guess as well as he can by analogy, what are the features which will prove permanent when the species is multiplied by seed in different situations. Cultivation will bring his specific divisions to the test, in the same manner that cross-breeding is the test of the genera or kinds. No man can be a consummate botanist without some access to horticulture, or at least some attention to its results. The greater number of botanical genera have been formed on the view of dried specimens, in which the parts collapse and cannot be truly discerned ; consequently, I find scarcely a genus

to which I have occasion to refer, in which false facts are not asserted, from the want of opportunity or industry to investigate truly and compare its general form with all its occasional variations. In the genus *Colchicum*, three sepals larger than the three petals which they enclose, the alternate length and insertion of the filaments, and the thickness of their base, are, I believe, true generic features. If they should be found deficient in any species, a thing which I do not much expect, it will be one of the many instances in which a feature becomes obsolete without affecting the general character of the type, as in the section *Azalea* five of the stamens of the genus (*Rhododendron*) are oftener deficient than present. Cross-breeding shows that such a deficiency is not original, but an incident. By true generic features I mean features that belonged to the type of the genus, whether that was the created type, or whether the genera themselves had diverged from fewer created individuals; an inquiry which would be superfluous and vain.

The facility with which the larger *Rhododendrons* intermix with some sorts of *Azalea* is now well known, and it is quite clear that *Azalea* is a condition of the same genus, in which half the anthers are usually deficient (half in the perfect form being of inferior power), and the leaves disposed to be deciduous, although they are deciduous also in *Rhod. Kamchaticum*, *Dahuricum*, and one or more Chinese species. Some seedlings of the yellow Pontic *Azalea* frequently produce seven, eight, or nine anthers, and *Indica* with evergreen leaves has usually a fuller complement, but is much more unwilling to cross with the evergreen *Rhododendrons*, showing clearly thereby that the feature which had been assumed for the generic character, is even of less importance than some secret difference which we cannot discover amongst the species. *Az.* (so called) *squammata* has ten stamens. From *Rhodora Canadensis* impregnated by *A. Pontica* I obtained a plant (*A. Seymouri*, Bot. Reg.) which would everywhere pass muster as *Azalea*. It is therefore preposterous to look upon *Azalea* and *Rhodora* as other than strongly marked and defective sections of the genus *Rhododendron*. It was my original notion that the cross-bred produce from such plants, if placed alone in a soil and climate perfectly congenial to their fructification, would perpetuate the cross-bred type. I am satisfied that in many cases that would occur, but perhaps not where the diversity is as wide as between *Azalea* and *Rhododendron*. The crosses between the Nepal, Pontic, and American *Rhododendrons* are fertile, and doubtless would perpetuate themselves, though with a good deal of sporting. I formerly mentioned that the result from the impregnation of the shrubby *Calceolaria integrifolia* by *Calceolaria plantaginea*, which is quite as humble and herbaceous as a plantain, was remarkable, the whole produce having a similar aspect, that of a very dwarf plant, with long serrated leaves on very short stiff branches, the inflorescence being exactly intermediate between that of the two species. It appeared

at first to be sterile, but last year I obtained a pod from it, and it has reproduced itself as perfectly as if it were a natural species from the mountains of Chili; set with the pollen of other hybrids it has produced handsome varieties perfectly herbaceous. The whole produce of the pod I have mentioned having been similar to the parent plant, and quite distinct in appearance from any other *Calceolaria*: there can be no doubt that, if they were planted in a wild spot, of which the soil, circumstances, and climate suited their growth and fructification, a new species, according to the terms and acceptance of botanists, would have been there established; and yet any person who cultivated *Calceolaria integrifolia* by impregnating it with *C. plantaginea* would obtain the like. We learn that most of the fine heaths of South Africa are very local. Above thirty years ago I announced that I had crossed *E. vestita coccinea* with *jasminiflora* (though Mr. Salisbury fancied they were of two separate genera, on account of the shape of the seed-pods); and it is now ascertained that Mr. Rollisson, of Tooting, raised *E. jasminiflora* by mule impregnation between *E. Aytoni* and *ampullacea*, and several others, of which no wild specimens have been found, and kept his secret until his death for the sake of profit. The genus *Erica* not yielding its pollen till the anthers are forcibly touched, and having the stigma therefore extremely likely to be hybridized in a wild state, there seems reason to believe that the species have been multiplied on the African wastes not merely by the variation of soil and position, but still further by the intermixture of the various forms which had so arisen. Such things occur occasionally even between plants widely distinct. A single bulb of *Crinum submersum* was found in a pool of water in Brazil in company with plants of a variety of *C. crubescens*, one of which had been impregnated by pollen of *C. scabron* which grows on woody hills, and of which the pollen must have been brought by an insect or humming bird. I must not quit the mention of *Rhododendron* without stating that the mules of the late Mr. Smith of Norbiton by *Azalea Sinensis* were raised, as I know for certain, from a white *Rhododendron* of the cross between *R. Ponticum* and the white maximum, which abounds on the hills of Jersey in the United States, being a distinct local plant, impregnated by *Azalea Sinensis*; and that it is erroneously stated in the Ghent 'Flore des Serres' that they are crossed by *Rh. arboreum*. I saw the mother plant when the seed-pods were still green. Mr. Smith crossed *R. arboreum* with *Dauricum sempervirens*, but I could not prevail upon him to sell the plants, or house them, and they all died young from frost and neglect. My own *Rh. Aprilis* was raised from a Pontic *Rhododendron* by *Dauricum sempervirens*, and has made no seed.

Let us now take a view of the circumstances attending the genus *Glaadiolus*. With the exception of the few species of which the lower lip is abbreviated, on which account those were erroneously formed into a separate genus *Anisanthus* by Sweet, they are pretty uniform in the shape of the

flower, with much diversity of size, color, foliage, stature, and even seed, which last feature induced Sweet to build up another false genus *Sphaerospora*. Forty years ago I first crossed the large and brilliant scarlet and white *Gladiolus cardinalis* with the smaller, but more freely flowering, *G. blandus*, which sports with white, purple, and rose-colored flowers, and (under the name of *carneus*, which was in truth rather a local variety of the same) of a coppery-flesh color. The result was a fertile breed of great beauty, of which the prevailing color was purplish-roseate. Crossed again with *cardinalis* it yielded florid plants, scarlet, copper-colored, rose-colored, white, and purple with endless variation. By a cross of the first mule and of *cardinalis* itself with *G. tristis*, of which the flower is pale yellow with brown specks, deeper tints and rich speckling were introduced, with a difference in the foliage and seeds, the seed of *G. tristis* being smaller and longer, its leaves rigid and quadrangular, the transverse section exhibiting a cross. The seeds of *cardinalis* are like those of *blandus*, but larger. There can scarcely be two species more dissimilar than *cardinalis* and *tristis* in any genus which has the form of the perianth uniform, the latter having such remarkable leaves, narrow, rigid, and erect, a slender stem, with night-smelling flowers, and the former very broad, semi-recumbent, glaucous foliage, and an inclined half-recumbent stem with large scarlet and white blossom; yet the produce of these intermixed is fertile, and where the third species *blandus* has been also admitted into the union, it is fertile in the extreme (incomparably more so than the pure *G. cardinalis*), and by that triple cross the tall strong *Gladiolus oppositiflorus* of Madagascar has also produced offspring, which, though not disposed at present to make seed freely, has produced some this year. Again, the first of these mules was fertilized by *G. hirsutus* (known at the Cape by the name *rosens*), a plant with flowers straighter than usual in the genus, and strongly scented, the leaves hairy and margined with red. That cross has not as yet proved fertile. The same *G. hirsutus* was crossed by Mr. Bidwill at Sydney, where the Cape bulbs thrive more freely than here, with *G. alatus* (which Ecklon wished to turn off into a genus *Hebea*), having hard, rigidly-ribbed leaves, a short stem, and orange flowers. The cross-bred plants flowered here last autumn, being intermediate in foliage and flower. The only opportunity I have had of crossing *G. alatus* with the first-named mules was defeated, notwithstanding much precaution, through the introduction of pollen by the humblebees, which are dangerous marplots to such experiments. The showy *G. Natalensis* (called also *Psittacinus*) of the Natal country, which endures more frost than any of the southern *Gladioli*, though it suffers much from July rains in many positions, has been freely crossed by myself, by Mr. Belfield, by Mr. Bidwill, and by cultivators on the Continent, with *G. oppositiflorus*, a Madagascar plant, found perhaps also in Caffraria, and often called improperly in the shops *floribundus*, an old name for a very different plant. The cross named

G. Gandavi (for the adjective name *Gandavensis* to a garden cross is very objectionable) has been figured in the beautiful Ghent periodical work of M. Van Houtte and his fellow-laborers in botanic and horticultural science. It is there stated most erroneously to have been raised between *Natalensis* and *Cardinalis*. It flowered at Ghent for the first time in Europe, the soil and climate being much more congenial to *Gladioli* there than at Spofforth and in the west of England, but some of the seedlings raised in Devonshire and taken to Sydney had flowered earlier. Abundance of beautiful seedlings have been raised here and abroad between *cardinalis* and *oppositiflorus*, and *vice versâ*, many of which have been sent over from the Continent under the name *G. ramosus*, as if they were plants of a natural species. Those from abroad have generally perished soon here, the soil and climate being too damp, but my own seedlings, probably the opposite cross, have a much stronger constitution, more variety of color, and have this season ripened much seed. This statement might perhaps induce the reader to think all the species easily convertible; but it is not so. If I am asked why, I can only say, that the ways of God are not as our ways, and are past finding out. The cross erroneously stated to have been made between *G. Natalensis* and *cardinalis*, if not absolutely impossible, is so difficult, that repeated attempts made during successive years by myself, and by J. Trevor Alcock, Esq., who interested himself in this matter, and probably by many others, have all proved abortive; and no cross has been effected, as far as I know, between *G. Natalensis* and any species from the Cape territory, although both *Natalensis* and the Cape species mix readily with the Madagascar plant. I am now trying whether the cross *G. Gandavi*, being half-blood, will mingle with the Cape species, and the result is not yet quite certain. I lately set nine flowers of *G. oppositiflorus* with pollen of *G. hirsutus*. Large pods were readily produced, but unexpectedly they proved to contain only chaff and perishing kernels, the fertilization having perhaps extended to the seed-vessel and the outer coat of all the ovules, without having vivified them; but I believe one frosty night in August caused the failure. Five equally fine pods were produced at the same time on a scarlet $\frac{3}{4}$ *cardinalis* mule. Few of their ovules were at all fertilized, and the greater part of those were chaff, but a few apparently good seeds were amongst them, which will probably vegetate. *G. Gandavi* itself has ripened its seed three successive years; and one from the first batch of its descendants is now in flower. It preserves the cross-bred type, and might be accounted a distinct species, if I did not know that it was raised from *oppositiflorus* by pollen of *Natalensis*. It reverts, however, a little towards the male parent, the purple stripes of the female parent being less strongly marked than the original mules, and the flower is scarcely as large or bright-colored, following the course I have observed in other cases, that seedlings from a cross-bred plant by its own pollen sometimes degenerate in the size or brilliancy of their flowers.

We must next turn to the Gladioli of the northern hemisphere, there being, however, a plant of intermediate position, *G. æquinoctialis*, on the heights of Sierra Leone. The northern Gladioli are all purplish, with a tendency to rose-color, and in a few cases to blue, excepting the whitish and the white varieties. They peremptorily refuse to breed with the Cape species; and, although I will not say that the cross is impossible, I have failed in so many attempts that I have abandoned them. But although the northern species differ somewhat from those of the Cape territory, and agree with *G. Natalehsis* in a more direct presentation of the flowers to the front from an erect stalk, there are a great many different local forms of them, with a great general similarity of aspect and intermediate forms, which almost defeat the attempts to distinguish them specifically, but furnish, with a similarity of flower, a strange diversity of seeds—the winged or foliaceous margin of the African species being conspicuous in *Byzantinus*, *communis*, *Boucheanus*, and some others; totally disappearing in *G. segetalis*, *Fischerianus*, and some others; curtailed in some varieties, and almost obsolete in others, of *G. communis*. The gradual curtailment of that margin in varieties of *communis*, as well as the close resemblance of *G. segetalis* to them, shows that the separation of the latter as a genus is preposterous. But there is another strange circumstance connected with them, which tends to show how species originate. *G. Byzantinus* will grow and increase greatly in almost any soil or situation; *G. segetalis* is very apt to die at Spofforth—I supposed it tender and fearful of wet. The white *Gladiolus commutatus* of Bouché, *communis albus* of the Dutch, but in truth a white *G. segetum*, always dies at Spofforth—I believe they perish because the soil, however good for barley, is too light for them. Near Trieste and in Santa Maura *G. segetalis* engrossed strong yellow ploughed land that lay flat and wet, and was also pestered by *Aristolochia clematidis*; but *G. Illyricus* is only found in meadows of alluvial soil subject to inundation; and where I saw it in flower in May, near Trieste; the sod was then three inches under water. Yet these three species require nice discrimination to separate them. Their case is somewhat like that of the wrens, *Silvia sylvicola*, *trochilus*, *rufa*, *loquax*, and *Temminckiana*, which are only distinguished by skilful persons, yet differ greatly in note, nest, and habits. Although the northern Gladioli, which conform with *cardinalis*, &c. as to their seed, will not breed with them: I believe, on the contrary, that there is no obstacle to their breeding with their European congeners that have round, unwinged seeds. In the genus *Schizanthus*, *retusus* refuses to breed with *pinnatus*; though they conform with each other in all respects except the size of their seeds—a circumstance which is not an obstacle in *Gladiolus*, but is so in *Anomatheca*, as I have already stated. I can suggest no direct solution for that mystery; but some difference of constitution probably prevents the pollen from deriving what is essential from the juices of the female plant. I should conceive that

G. Byzantinus and communis, which have seeds like the African sorts, and are not particular as to position, are nearest to the northern *Gladiolus* of the oldest days ; that some of its offspring, having fallen into peculiar situations, have acquired constitutional peculiarities, with some alterations of aspect and structure, that have become fixed characters.

There are some classes of plants with great diversity of forms, but so graduated as to render it almost impossible to subdivide them satisfactorily into distinct genera and species. I find the undescribed *Colchicums* from different localities varying so much from each other generally, and yet so little fixed in their own usual peculiarities, that all specific names for them seem vain. Again, the difference which separates *Colchicum* from *Meren-dora*, viz. a compact slender tube in the former, and in the latter, instead of a tube, six long slender bases to the leaflets of the limb, which are fastened together by little hooks at the mouth of the seeming tube, but easily separable, would appear to furnish a good generic distinction ; but the perfect agreement of the two in habit and general appearance induces me to think that they were united even in comparatively late periods of the world, and I should expect to find them capable of intermixture, and I shall take the first opportunity of making the experiment. The *Sisyrinchoid* plants include a mass of individuals which it is most difficult to class under distinct genera, but which are very remote from each other in habits and appearance, and they slide away through the *Tigridialike* plants towards the real *Irises* and their near kin, in a manner that cannot be readily brought within the scope of regular systematic views. When we turn to the multitudinous iridaceous plants of the Cape territory we find no less difficulty, and the subdivisions are baffled by forms, of which it is difficult to dispose consistently. Sweet's small *Orthrosanthus multiflorus* was naturally remanded by Dr. Lindley to the *Sisyrinchiums*, because its flower seemed to conform with some which were not peculiarly allied to it ; but no person can look on Mr. Mangles' *Orthrosanthus cæruleus*, a plant of the largest growth amongst those races, and another lovely species introduced by him, which I call *O. gracilis*, and not at once recognise the aspect of *Orthrosanthus*, the inflorescence being borne on the axils of the flower-stems, instead of being simply terminal, which is a feature of considerable importance, and seems to indicate that the race is at least now distinct. We are laboring, therefore, under great difficulty in assigning the just demarcations to the genera or kinds ; and it is evident that attention to the cultivated forms, and intermixture of plants is no less essential to botanical knowledge than the inspection of wild specimens. By that we are enabled to learn how far the offspring of individuals can sport at the present day, and how far those which seem to be distinct are capable of union ; and by a survey of the results it may perhaps become apparent at last whether that union is in truth only a re-union of things that have been severed in ancient times.

The genus *Hymenocallis* was mainly separated into species, as Dr. Roxburgh had distinguished the East Indian forms of *Crinum*, by the proportionate length of the tube and limb. That answered tolerably well as a prevailing feature, while the known forms were few, although we often found great difference in the proportion of flowers on the same umbel; but the species have poured in upon us from so many localities, without certain indications of their natural habitation, and so many mules, bred accidentally as well as intentionally under cultivation, have been mixed with them, that it becomes almost vain to attempt to continue subdividing them further into species; and it can only be said of each fresh variety, without the particulars of its habitation, that it is an *Hymenocallis*. I was able on the first sight of two forms brought by Mr. Cuming from Manilla, though new to me as to their peculiarities, to say that he had got them from a garden where they had been probably introduced on the removal of some governor and his family from Spanish America to the east, because *Hymenocallis* is peculiar to the western hemisphere; and he at once admitted the fact to be so. The more deeply plants are investigated, the more will it be felt that the establishment of kinds or genera, the discrimination of their higher affinities, and the pursuit of specific diversities to their local habitations and associations, with research into the causes that are in operation there, are the duties of the botanist; but that the distinctions between species and variety are not sufficiently substantial and positive for any scientific reliance to be placed upon them, and that a dispute on such a distinction is waste of words and battling with the air. The genus *Hymenocallis*, however, though sliding into variations almost indiscriminate, is perhaps one of the races most deserving consideration of all that exist in the world. It is confined to the New World (that is, to the American continent and the West Indian islands), within a certain range from the equator; it rejoices in wet, and in cultivation may be kept in pots immersed in water. I have not found any one form of it object to immersion during its season of growth. In the form of its flower it approximates, especially through *H. speciosa*, which has the filaments shorter and rather converging to *Pancratium* of the Old World so nearly, that it is difficult to separate them very satisfactorily by the inflorescence, though the stamens of the former have rough pollen, and are longer and looser; those of the latter stiffer, shorter, and conniving. But no *Pancratium* has been found in a swamp; they abhor excess of wet, and one which it is difficult to cultivate, *P. tortuosum*, *mihi*, grows in the sandy desert of Arabia, near Gedda. *Pancratium* has shelly black seeds, and *Hymenocallis* large, fleshy, green seeds, which have been usually called albuminous, so that they stand in two widely distinct sections of the order Amaryllidaceæ, separated by a feature which in other orders has been admitted even amongst the insuperable limitations of the order itself. Will *Pancratium* and *Hymenocallis* now blend their offspring? I

believe they will not ; and, if produced, I am persuaded that it will be sterile. Were they created distinct from each other at the beginning ? I cannot compare their flowers, and presume to say that I think they were. I will now state a fact which I had hoped to elucidate further, but either I had not opportunities of repeating the experiments, or other matters prevented me from availing myself of them. At p. 211, Amar., I gave a detailed account of the origin of four seedlings, called *H. amœna* var. *lorata*, *hortensis*, from four weak discolored seeds of *H. amœna*, which had been deprived of its anthers and touched with the pollen of another genus. That pollen was taken from *P. Illyricum*. The lorate leaves, and the weakness and discoloration of the seeds, at first made me think that a bigeneric cross was obtained ; but there was no increased hardness of constitution, and no difference in the inflorescence derived from the male parent. I have, therefore, no reason to assert that *P. Illyricum* had had any influence. Accidental admission of its own pollen, or of that of some other *Hymenocallis* in an impoverished and half-effete state, probably produced the variety. The four seedlings were precisely similar to each other : they have not often flowered, and have not borne seed, but they have been rather neglected. It is desirable that further experiments should be tried on *Hymenocallis* by pollen of *P. Illyricum*, and *vice versa* ; but I do not think they will blend, though I am a little less confident on that point than I should have been some years ago. If these four seedlings had been raised by the accidental access of pollen nearly effete from some other *Hymenocallis* that had flowered lately in the same house, their flower should have been modified. Is it possible that a grain of its own pollen, nearly effete, had touched the stigma, in spite of my precautions, and that its defect was the cause of variety ? If so, an important clue would be obtained. Is it possible that the pollen of the cognate genus *Pancreatium*, without being able to fertilize the ovules, could help the defective grain of its own kind to some ingredient in which it was defective, and so obtain some influence over the produce, without being actually its parent ? If, as I believe, two grains of pollen cannot set simultaneously in the same ovule, that could not be ; but it is a point open to inquiry, and upon which I merely say, that where I have carefully mixed the pollen of twelve species of *Calceolaria*, that of one only took effect, and that I have not succeeded in any attempt to effect a double or mixed fertilization at the same time.

In former publications I laid very great stress—and I now believe too much stress—on the form of the fruit, for I think that important part of vegetation is no less capable of modification and change than other parts thereof. The extensive genus *Iris*, with great general similarity of aspect, exhibits some anomalous diversities. In *Iris setosa*, otherwise very like *I. Virginica*, the conspicuous erect petals of the genus have disappeared, and given place to three slender bristles ; in *Iris Sibirica*, and the species closely

connected with it, the solid flower-stalk has become a fistulous pipe ; in the Gladdon, the outer and second coats of the seed, which in the fistulous sorts is hollow, becomes filled with pulp, and the seed assumes the color and semblance of a ripe berry. The bulbous races have their own peculiarities. Theory and experience lead me to think that the whole of the extensive bearded race that occupies the Mediterranean formation and its skirts, creeping on as far as Nepal, from the many very dwarf species to the large Germanica and pallida, are easily convertible and stand almost on the footing of local varieties. I cannot blend them with the fistulous Siberian or with the species belonging to the Virginian type. I think the bearded Mediterranean, the fistulous Siberian, the Virginian type, the Gladdon, the bulbous race, perhaps the American vernal, the so-called genus Dietes, and some other portions of Iris, to have been departures from the first created type, which occurred in much older times than the more extended diversification of species, and that we shall now find it difficult, if possible, to pass those limits in cross-breeding ; and such is my view of the whole vegetable kingdom, though in some families it will be found more easy to confound the new forms and revert to ancient associations than in others. In the genus Rosa (though herein I speak from observation and not from experience) there is probably no impediment, not even respecting R. berberifolia, the singular link by which the rose is connected with the Cistus. In Rigidella, on the contrary, it is most difficult to cross the two pendulous species, and I am not sure whether I have at last succeeded in effecting it or not, though the plants are very conformable, except that one flowers in the morning and the other exactly takes its place in the afternoon. The genus Pelargonium, as well as Calceolaria, has furnished much beauty to florists who have crossed *ad infinitum* the different varieties first obtained by hybridizing. Pelargonium has been subdivided into various genera, which have not been generally adopted, because their limits are obscure and unsatisfactory ; and it is only by trying to cross them that we can find where the positive impediments lie. It is impossible, as far as I have seen, to cross the race to which the horseshoe scarlet belongs, or that to which tricolor belongs, with those which the florist has intermixed. With very little apparent structural difference, there seems to be a secret insuperable bar ; and I think they were probably severed in a much earlier period of the world than the kinds which will breed together. The first great step for the florist in that race was the production of the plant called Ignescens, by the intermixture of the family, to which betulinum, Citriodorum, &c. belong, with a tuberous-rooted scarlet one, that might however have been thought less likely to breed with them than those which refuse to do so. The fertility of that plant set wide the doors of innovation, but the stream is confined within certain limits. Florists, however, have not availed themselves of the further help they might have drawn from the colors of the tuberous sorts

that might be brought into action, their aim being directed more to size and form than to variety ; but as the scarlet-color has been drawn from a very small flower to one as large as their rising-sun, so the blood-red of *P. sanguineum*, as well as the black and the yellow of the tuberous kinds, might probably be brought into like conspicuous manifestation.

I am not aware that any difficulty has been found in crossing the various species of *Fuchsia* ; but the natural forms of *F. virgata*, *gracilis*, *globosa*, and *discolor*, appear to me so superior to the mixed shapes produced by gardeners, that I have been unwilling to deteriorate them by intermixture. In one *Fuchsia* of a mixed race I was struck with the appearance of the green color of the fruit of *F. fulgens*, but more vivid, though in all other respects it seemed to conform with those that bear red berries.* As the natural green fruit of *Fuchsia* is agreeable to the taste, it is possible that a hardier green-fruited race may be obtained with the same quality. The supposed sterility of mules has very much deterred cultivators from trying how far plants that bear palatable and wholesome fruit may be intermixed, and, excepting Mr. Knight's experiments, very little has been done in that branch. Our climate does not suit experiments, to ascertain whether the lemon, orange, shaddock, citron, and lime are indefinitely convertible, and, if not, exactly what insurmountable impediments occur ; but I believe no one has even tried to blend the very highly-flavoured *Fragaria viridis* with the larger and more fruitful kinds, and gardeners adhere to the chance of improved seedlings from the most approved individuals, though they are aware that size, without flavour, is unsatisfactory. It is remarkable that in some genera bearing eatable fruit the crosses are usually fruitful, and in others not—a circumstance which requires deep investigation. The few mule *Passifloras* raised seem indisposed to make seed, and still more to fill the fruit, if formed, with succulent pulp ; but it does not follow that the case will be such with all. *P. quadrangularis* bears a large, rich-flavoured fruit in a stove under peculiar treatment ; *edulis*, a better-flavoured fruit, in a greenhouse ; *laurifolia* and *maliformis*, very different fruit, in a stove ; a small species sent to me by Mr. Maclean, from Clorillo above Lima, under the name of *suffruticosa*, bears a delicious fruit of the size of a gooseberry in a stove ; *P. alata*, nearly akin to *quadrangularis*, has a vile fruit ; *carulea*, no better ; but it remains to be tried whether no hardier species of *passiflora* will give a fertile, succulent, and well-tasted fruit by intermixture with the best, tenderer kinds. In the genus *Cactus* it is so. Well-flavoured mules are obtained at once from *C. Ackermannianus*, of which the fruit is very bad, by crossing it with *C. speciosissimus* or *Phyllanthoides*. It is remarkable, that in the section *Cereus* the mules are as fruitful, and have the fruit as juicy, as the natural forms, however dissimilar. Nothing can be more unlike each other in the same genus than the two species I have last named, yet they breed willingly together, and the fruit of the mule differs from that of either parent as much as the

flower. I stated (Amar. p. 345) that I could not see a single point in the generic character of *Echinocactus* to separate it from *Cereus*, and that I expected them to be found able to intermix. I observe that it was once proposed to take the stem as the distinctive generic feature, unless it should be thought better to combine them in one genus. To that I say, that, while species of *Cereus* disagree, in that some of them have fleshy, angular, thorny stems, and others flat, leaf-like, smooth stems, but are proved to be of one genus, we have not sound grounds for separating *Echinocactus* on account of such a feature; and I contend that the separation is a question of fact, not of option and preference, as if the botanist were a commissioner to set out the fences for an enclosure of waste lands. I have very few *Echinocacti*, and have had no opportunities of testing the point; but I requested Mr. Beaton, a most intelligent gardener, when he had the care of Mr. Harris' rich collection, to do so, and he very soon sent me seed from the mule *Cereus* called *Jenkinsoni* by *Echinocactus* *Eyresii*, but they were only outwardly perfect, and did not germinate. If he had remained longer there, I think, he would have effected the union. Mr. Beaton produced the cross between *Ribes sanguineum* and one of the yellow-flowering species, which brings that genus to my recollection. The gooseberry and red or white currant are held to be of one genus, but it has not been found practicable to blend them, and probably it is not; but it does not follow, because they will not breed together directly, that they might not through some other species, as in the genus *Gladiolus*, *G. cardinalis* and *Natalensis* refuse to mix with each other, but do freely with *G. oppositiflorus*. Since both these crosses with *Oppositiflorus* make seed, I consider that, by perseverance, the impracticable cross can be nearly forced, by reducing both crosses one step further from the dissentient parents, till the two crosses are found able to intermix, and then crossing the produce upwards, step by step, with a greater approximation to them. I am not aware that any attempt has been made to cross the acid with the sweet currants, which might so perhaps yield a new and pleasant fruit, and the attempt should be made. It is very difficult to foresee which combinations, when made, will produce a fruitful offspring. The genus *Nerine* strongly exemplifies that difficulty. It consists of two portions, those with regular corolla and straight filaments and style, and those which have them bent and the corolla distorted and inclined. There is a cross section of the genus not tallying with the above-mentioned distinctions, viz. those with centripetal inflorescence, i. e., beginning to flower on the outside of the umbel and flowering last in the centre, and those with centrifugal inflorescence. The cross between *N. curvifolia* of the first section and *pulchella* of the second is very fertile, both being centripetal; that between *N. curvifolia* and *undulata* of the second is absolutely sterile, because the latter differs in being centrifugal. The mule, however, follows the male in being centripetal, but is quite barren. A difference, therefore, which had been overlooked by botanists till I ob-

served it, seems to be the outward mark of the impediment which makes the male unfruitful. Cross-breeding, therefore, shows that feature to be more important than it had been thought.

The blending of colors amongst cross-bred plants is rather capricious. The golden-flowered Swedish turnip crossed with the yellow-flowering white turnip did not give an intermediate shade of color, but some plants with golden and some with yellow flowers. The orange and the blue *Anagallis* gave a pale, dull pink. The scarlet *G. cardinalis* with a white *G. blandus*, and with the yellowish *G. angustus* and *G. oppositiflorus*, gave a purplish-rose color. *Rhododendron ponticum* and *Rhodora Canadensis* by the yellow *Azalea* very much discarded color, instead of taking an intense mixed hue. The yellow and red-flowered *Ribes*, however, gave a dull rust color. It generally requires two crosses from the scarlet to fix the bright color in the mule. *G. Natalensis* impresses its color much more strongly on *G. oppositiflorus* than *G. cardinalis* does, being more nearly akin; whether from that cause or not I will not presume to guess.

Hybrid *Alstroemerias* have been raised, but with difficulty, and they seem delicate. I believe it was a mistake to suppose Mr. Van Houtte's fine collection of many-colored *Alstroemerias* to be cross-bred. Poeppig had long ago informed us that *A. haemantha* sported in the Subandine meadows of Antuco with every shade, from white to citron, orange, rose-color, vermilion, and crimson; and I believe his plants to have been obtained by seed from that quarter, which I had long vainly tried to obtain. I have raised a *Bomarea* between *variabilis* and *acutifolia*, which seems to be fertile. I do not believe it would be possible to cross a *Bomarea* with *Alstroemeria*. I think I may venture to say that, as far as I have observed, the prevailing disposition of cross-bred vegetables seems to assimilate more to the male than to the female parent, though the appearance may possibly be sometimes the reverse, and often strictly intermediate; but as far as I have seen, if we obtain a cross between a hardy and a tender species, the produce, where the male is hardy, will be much more hardy than where the female is hardy and the male tender. This is very important and very conspicuous in cross-bred rhododendrons. I do not think it is so with animals, where the cases seem analogous. Having bred many horses, I have found mares that were roarers almost invariably produce roarers, and very little, if any, evil occur from breeding by a roaring horse. Many years ago Mr. Milne, of the Fulham nursery, obtained three mules, which are well known, from *Passiflora racemosa* set with the pollen of *cœrulea*. The produce did not require stove cultivation, like the female parent, but they have been generally sterile. From their first distribution to the present day they have grown in my cool conservatory, flowering abundantly, but sterile, with this exception, that many years ago one shrivelled, pulpless fruit was formed and ripened, containing twelve good seeds, which vegetated. The flowers of all were nearly similar to those of

P. cœrulea, the male. One of them is growing in the same conservatory, with the flower, I think, rather finer than that of the common *cœrulea*, and it has never borne fruit. The rest having been planted or left out of doors at different times, have been killed by frost or neglect. At the time when this dry fruit was ripened, there was a plant of *P. cœrulea* in another house in the garden, though disconnected, and eighty or ninety feet distant. Therefore, either the flower was fertilized by pollen of *cœrulea* brought by an insect or by accident, and two crosses by the pollen *cœrulea*, made *cœrulea* itself from the ovary of the tender scarlet *racemosa*, or the mule was fertilized by its own pollen, and the offspring diverged to the male type, throwing off the similitude of the female altogether. The natural *cœrulea* did not fruit here while I possessed it, and it dies when planted out at Spofforth.

I have already stated the possibility of raising the poetic narcissus by two or three crosses from a daffodil, and I have also shown that the *Gladiolus* crossed from *G. oppositiflorus* (which breeds freely with the Cape species) by pollen of *G. Natalensis* (which will not), produces seedlings, one of which having flowered, reverted a little towards the male type. Here then we have the like fact. The *Passifloras* were produced by the pollen of the mule, or by accidental access of the pollen of the male parent. If by the former, these widely-separated species are convertible, and a new form originates from their union; if by the latter, the male type may be obtained by repeated crosses from the ovary of a very different plant; and, whichever be the case, the origin from one created kind is proved in that instance, and, by implication, in all cases of similar difference. I believe all the Cape species of *Gladiolus* to be convertible; I have found no positive impediment. The rare *G. abbreviatus* might be almost made between *G. cunonius* and *tristis*; it has the curious leaf of the latter, and a flower approaching to that of *G. cunonius*. Mr. Plant's mule consists of the two, with the addition of *G. cardinalis*. Perhaps I have forgotten to mention that *Corbularia* will not breed with the other *Narcissi*. I have crossed the common honeysuckle with *hirsuta*, *lutea*, and Fraser's scarlet; but the berries of the latter were devoured by a robin. It is advisable, in such cases, to tie a cap of muslin over the bunch of flowers, both to exclude pollen and ward off the robins and blackcaps at a later period. I have had a whole umbel of berries, supposed to be poisonous to man, of *Hæmanthus multiflorus* eaten in one morning by a friendly robin in the stove.

I mentioned in a former treatise a remarkable circumstance concerning the purple hybrid *laburnum*, on a plant of which a small branch with the habit and nearly the leaves and flowers of the diminutive *Cytisus purpureus* had sprouted and maintained itself in the garden of my brother. The circumstances, which afterwards came to my knowledge concerning that remarkable plant, are still more extraordinary. In the garden of the late Mr. Loudon, at Bayswater, upon a large shrub of the same hybrid, one of the limbs resolved itself into its elements, diverging into two branches, one of which

had the small weeping habit, leaves, and flowers of *C. purpureus*, the other nearly the leaves and racemes of yellow flowers belonging to the common laburnum; and those two branches ripened good seed, while the rest of the shrub producing the hybrid blossom was absolutely sterile. The seeds borne by the smaller branch were less abundant, and had been lost; those on the yellow branch were plentiful, and I raised many plants from the seeds, which were kindly given to me by Mr. Loudon. They returned nearly to the form of the common laburnum, excepting that two of the seedlings showed a little purple tinge on the green stalks, which might perhaps, have extended to the flowers, but they were lost by neglect. In the same season the diminutive branch on my brother's tree bore seed, and from it I raised plants, differing very little from the usual *C. purpureus*. I have since learned that in many places, where this mule has stood some years, the like phenomenon has appeared. The history of the plant is, that it was not raised from seed, but made its appearance in the following remarkable way:—A number of stocks of laburnum had been budded with *C. purpureus* in a French nursery-garden, and the bud on one of them died; but the wood and bark inserted lived, as frequently occurs in such cases. After some time new eyes formed themselves, one of which produced this hybrid, *C. Adami*. I suggested, in a communication to Mr. Loudon, that it must have broken from the exact juncture, and proceeded from a cell of cellular tissue formed by the union of two cells, which had been cut through, and had grown into one, and which, therefore, belonged to the two different plants, half a cell of the tissue of *C. purpureus* having been spliced to half a cell of *C. laburnum*. The necessary consequence would be that a bud formed from that compound cell would derive qualities from both species, but qualities less fixed and innate than those which are derived from generative union. This has been looked upon as a speculation, but I consider it nearly amounting to a certainty, because I think that the consequence is necessary, and that the phenomena cannot be accounted for in any other manner; and nothing of the sort has occurred to any known mule production, vegetable or animal. Since that time my brother's shrub has put out many of the large-leaved yellow branches and of the small branches, and they are fertile. It occurred to me that it would be a confirmation of my view, if the reverted branches of each kind should keep to opposite sides of the stem; and on examination that proved to be decidedly the case. Whether that circumstance occurs elsewhere or not, I do not know; but it looks as if one side of the wood adopted the character of one-half of the original cell, and the opposite side the other character. I think that clever gardeners might thus obtain crosses between plants which will not intermix seminally. The olive and privet might be tried with hope of success; for the privet, when the olive is grafted upon it, is very persevering in throwing shoots from the old wood. A long slice of privet should be inarched on the olive with a very sharp and clean cut of both the woods, and

then teized by rubbing off the buds, till it breaks on the exact suture. Of course many failures must be expected before a bud will be obtained from a compound cell ; but I think, with perseverance, it will be produced ; perhaps most easily by uniting half of two young stems of equal bulk from just above the root upwards. Let us, however, pause to reflect on this phenomenon, whatever be the mode of its operation. Here we have not only two plants, so very dissimilar as the almost arborescent yellow laburnum, and the weak, humble, small-leaved, purple-flowered *Cytisus purpureus*, produced from the seed of the same individual ; but, if we strike cuttings from the two varying branches, we have the individual plant itself actually resolved into its elements, and those perfectly separated. Can we for a moment hold, after contemplating that fact, that the Almighty certainly created those two plants distinct, and allowed them to become, from two individual kinds, one ; and from one be resolved again into two ? Have we any analogy in the vegetable or animal kingdom that can warrant such an extraordinary doctrine ? and is not the plain inference, that they were one individual kind when they proceeded from the Creator, and are so still, though diversified in appearance ? If two plants so dissimilar are admitted to have so diverged, the like course of change must be attributed to other genera also ; for I cannot think it will be shown that those two are by any peculiarities entitled to form an exception from the general law imposed upon vegetables. The only things that I know at all analogous are these, that a layer from a striped carnation, that has run to red, continues so ; that a branch of the variable Pompon variety of *Camellia Japonica*, that has run to red, continues so also ; that branches of the copper-colored Austrian briar occasionally revert to the usual yellow color, and the peach and the nectarine have been known to be produced on the same tree from one source ; but in those cases there is no supposed diversity of kind, or even of species. The seminal variety in the three former cases merely falls back to the more usual color ; and in the latter, two different cultivated improvements of the almond manifest themselves in the same plant. Whatever analogy they offer, confirms the view of the original identity of laburnum and *Cytisus purpureus*. It must be remembered that, if the smallest piece of bark be inserted into a different stock, and lives, whatever bud shall break from its tissue, exhibits the qualities of the plant from which that piece of bark was taken, without regard to the juices, root, or bark of the stock. If it proceeds from the stock, it exhibits its qualities ; if exactly from the suture, how can it avoid exhibiting the joint qualities ?

I know not whether *C. laburnum* and *purpureus* can be made to intermix seminally. The very handsome *Erythrina Bidwilli*, which flowered at Spoforth last August, having been sent to me from Sydney by Mr. Bidwill, and raised in that neighbourhood, either by himself or by Mr. M'Leay, from *E. herbacea* by pollen of *E. cristagalli*, is, I believe (unless Wiegman's asserted

mules, between vetches and beans, were truly raised), the first well-authenticated hybrid amongst papilionaceous or pea-shaped flowers. Mr. Knight only blended varieties of the pea. The papilionaceous forms are, however, so numerous, and the genera are divided by such inconspicuous differences, that it might be supposed that their intermixture would have been easy and frequent. Why they are of rare occurrence I know not, and have not tried to cross them. In this case the union of the two plants is remarkable, because the former produces its spike of flowers directly from the root, the leaf-bearing stems being barren, while the other parent is almost arborescent in a favorable climate, and blossoms from the axils and ends of the leafy branches, in which respect the mule follows it. Wiegman asserted that he had obtained fertile mules between the vetch and the bean, by merely making the plants grow in contact, tying them together, and leaving the operation to the bees. I mentioned formerly that there exists in England an obscure plant, which is a strong, handsome, pink-flowered prehensile pea, and bears fruit that has the appearance and flavour of a small bean. At the time I mentioned it, plants of the kind were fruiting plentifully in my curate's garden. This is an important fact in the consideration of our subject; for, if it is a cross between a pea and a bean, being very fertile, it must prove the singleness of their origin; if it is a variety of the pea having acquired and perpetuated the fruit of a bean, it seems to give the same result, that the two must have proceeded from one created type. When the generic characters, as ultimately stated by Endlicher, of *Pisum*, the pea, and *Vicia* to which the bean belongs, are carefully compared, it will appear that, except a little prolongation and straighter position of the flower, which in some other races would be immaterial, the only fixed feature of difference is the asserted roundness of the seed in the pea, and its lateral compression in the vetch and bean, a feature which, if the fact were undeniable, is insignificant in many other genera. If the pea, vetch, and erect bean have sprung from one type, and are convertible, to what result does that fact lead us? Can we maintain a multiplicity of created roses, cistuses, potentillas, cornflags, and irises in the face of that fact? Are we not forced thereby to the points, which I urged above thirty years ago, that the genera are the substantial divisions in botany; that the asserted difference between the species and local varieties of botanists has no firm basis; and that it is a matter deserving grave consideration, whether even a multitude of established genera are not variations from fewer original kinds, of which the real limitation may be found in a higher position amongst tribes, classes, or orders? And, if that point be established, as I humbly think it must be in the vegetable kingdom, upon what footing will the species and varieties of zoologists stand, when the analogies between plants and animals are fully considered, which it is not my province, and which I do not pretend to have sufficient depth of knowledge, to investigate?

The Orchidaceous plants exhibit the most confusive diversities. When it is made a question whether *Maxillaria Warreana* and *costata* should not be removed into the genus *Peristeria*, and whether *Bifrenaria* and *Dicripta* should not merge in *Maxillaria*, we seem to stand on very loose footing as to those genera, though the doubt may be perfectly consistent with the most skilful botanic discernment. And how should there not be such doubts, when we find the genus *Catasetum* produce at times, on the same stalk with its usual flowers, others that seemed, according to analogy, to belong to a different genus? *Cyanoche Egertonianus* produces at random forms of inflorescence almost as different, both in form and color, from each other as those of any two genera in the order. Can we, in face of those phenomena, assert that no vegetable since the period before the sun and moon gave it light, no bird or fish since the Almighty called them forth from the salt mud, no creature of the earth since it was evoked from the dust, can have departed from its precise original structure and appearance? Let us be more humble in our assumptions of scientific knowledge, less bigoted and self-sufficient in our examination of revealed truth, and let us give glory to the infinite and unfathomable power and wisdom of God. I call it self-sufficient to hold that ancient and obscure words can have no possible meaning, but that which we have been in the habit of attributing to them inconsiderately. It may be unacceptable to the botanist, who has been accustomed to labor in his closet over dry specimens, and thinks he can lay down precise rules for the separation of genera, and looks with complacency upon the scheme he has worked out, to find that the humblest gardener may be able to refute him, and force him to reconsider the arrangement he has made; but the fact is so. The cultivator has the test of truth within his scope,—

Examenque improbum in istâ

Castigat trutinâ ;

and, far from being an evil, I look upon it as a great advantage, because it will lead the industrious and intelligent gardener to take a higher view of the objects under his care, and to feel his own connection with science, and it will force the scientific to rely less on their own dictation, and to feel that they must be governed by natural facts, and not by their own preference. Cross-breeding amongst Orchidaceous plants would perhaps lead to very startling results; but unfortunately they are not easily raised by seed. I have, however, raised *Bletia*, *Cattleya*, *Orchis* (*Herminium*) *monorchis*, and *Ophrys aranifera* from seed; and if I were not during the greater part of the year absent from the place where my plants are deposited, I think I could succeed in obtaining crosses in that order. I had well-formed pods last spring of *Orchis* by pollen of *Ophrys*, as well as other species of *Orchis*, which had been forced; and if I had remained on the spot I think I should have obtained some cross-bred Orchidaceous seed. An intelligent gardener

may do much for science by attempts of this kind, if he keeps accurate notes of what he attempts, and does not jump at immature conclusions.

It was not surprising that the late Mr. Haworth should have told me many years ago that he did not thank me for my mules; not that I had sent him any, but because he probably began to have an indistinct misgiving that they were striking at the very root of the minute divisions which it had been the favorite labor of his life to establish, as definite and absolute. With accurate discrimination of individual specimens, and great industry in searching them out, his mind had not capacity even to combine the seminal variations of particular species, and he found the high-road on which he was travelling broken up by a troop of unexpected invaders. I mentioned long ago that I had raised at Mitcham primrose, cowslip, oxlip, and dark polyanthus, from the seed of one plant highly manured without any hybridization.

Concerning *Petunia*, and the genera allied to it, I have nothing to add to the observations in my treatise on hybrid intermixtures, *Anaryl.* p. 377—9, to which I beg to refer the reader. I have no reason to alter any of the views expressed in those pages, but I do not recollect that I pushed the experiments relating to them any further.

In a treatise on this subject I must not forget Plant's vegetable monster, of which I gave the particulars, with an engraving, at the commencement of the miscellaneous matter in the 'Botanical Register' of 1843. The sketches were made by myself with the most careful accuracy, from the three plants which were sent to me by Mr. Plant, in a dormant state, from which they never awoke. They were, in fact, seemingly past hope, or nearly so, when I received them, and began to turn mouldy as soon as they were watered. I believe he lost at the same time the fourth, which he kept for himself. Whoever will examine the engraving, and read the particulars detailed there, can form as just an opinion as I can, whether he really had obtained four anomalous monsters from *Gladiolus Blandus*, impregnated by an *Hippeastrum*, or whether they were something else which he had confounded with his supposed mule seedlings. They were like no vegetable known to me, and their strange form has certainly the appearance of fluctuation between the structure of a dry-coated annual corm, and a fleshy, tunicated bulb. Even Mr. Plant thought they would prove incapable of flowering. Their leaves, which I did not see, were stated to have been more glossy than those of a *Gladiolus*; and they scarcely appear to have been capable of a protracted existence, unless under the most unrelenting care. He stated that they had suffered from neglect while he was ill. I am inclined to believe that they were biordinate and semiabortive mules; for I cannot absolutely repudiate the possibility of monstrous impregnations, though I believe the produce to be doomed to a very brief existence, if ever brought to life.

P. S.—It appears from a communication lately received that I have not made myself clearly understood in the first article respecting the diversified

features that have become fixed characters in the human and other races. I consider that causes of change must have been in active operation in the first period after the deluge, which subsided, and no longer produce such powerful effects ; and that it is probable (whatever those causes may have been) that they were still more cogent in the periods which preceded the creation of man ; producing alterations of a much stronger character than any which have since arisen. If I am asked what those causes were, I cannot pretend to answer. But I think the cooling of the body of the earth, with consequent variations in the gases that emanated from, and were absorbed in, and surrounded it, a very likely cause of variations in the things that sprung therefrom. I imagine that at this moment the relative temperature and moisture of the fibrous roots and of the bulb or point of union between the root and shoot in vegetables, and between the feet and the head in men and animals, is of infinitely greater importance than either cultivators or medical practitioners have suspected. I am told that some persons who devoutly hold that mankind sprang as we are told, by generation, from one created pair, nevertheless think that the peculiar aspect of the various races of men was a judgment afterwards miraculously stamped upon them by God, as their speech also was diversified to separate them at the dispersion ; but, if that be admitted to the exclusion of natural causes, we must hold like judgments to have been inflicted upon dogs, of which the distinct races are quite as various, and their origin as much enveloped in obscurity. Neither do such persons consider rightly what a miracle is. It is a thing arising contrary to the usual and apparent course of events, and shown either by prediction, or by the circumstances of the event, to have arisen for a peculiar object ; but it may have been produced by the unexampled or even unusual operation of natural causes, which we cannot easily fathom, working together by the Almighty will to produce the marvel. The appearance of three suns in the heaven by an extraordinary effect of refraction is a well-authenticated fact, and it was a great marvel, but not a miracle ; that of the sun, continued after its hour of setting, whether caused by refraction or by some disturbing power that deranged the usual course of the earth's movements, was not merely a marvel, but a great miracle, because it happened at the prayer of Joshua, for the purpose of giving him light to overthrow those who were striving against God's people. The driving back of the Red Sea by a wind of unparalleled strength and continuance acting upon an unusual ebb-tide so as to lay bare a transverse sand-bank was in itself a great marvel, but occurring at the precise moment and place of the arrival of the Israelites so as to let them pass, and ceasing exactly at the fit moment to destroy all their pursuers, was a stupendous miracle. The plague of locusts fell last year on Zante, and the murrain both of beasts and potatoes has fallen on our own land ; but in Egypt they were miraculous, because specially invoked by God's prophet. The demonstration of the natural means through which the Al-

mighty worked a miracle, which could have been performed by no slight of hand, but by the power of Him alone, increases (instead of diminishing) the force of the miracle, by strengthening its credibility, and distinguishing it from the pretences of impostors ; and its force is infinitely greater when those natural means, unsuspected by the persons who witnessed and reported it, are brought to light by the progress of science in confirmation of the fact. I assert, therefore, without hesitation, that, if the diversification of the human races was intended with a view to effect their dispersion, such a miracle would, in all probability, have been effected by the operation of natural causes, and that the like diversification of other races proves that it was so effected.—*Journal of the Horticultural Society of London*, Vol. ii, part 2.

HOW TO PRESERVE THE VITALITY OF SEEDS.

Now that those who have friends in distant countries (and how few have not ?) are preparing to send them supplies of seeds, it may be as well to draw attention to the circumstances which mainly influence the preservation of seminal vitality ; for thus alone can be avoided the serious losses and the much more vexatious disappointments which attend the unsuccessful conveyance of seeds in long voyages. The whole philosophy of this matter, however, as far as it is understood, would occupy more space than we can spare, and therefore we can only touch upon the main points.

The preservation of vitality in seeds depends upon preserving the stability of the chemical compounds of which they consist. This we believe to be the hinge upon which everything turns. Before a seed is quite ripe its elements are highly unstable or liable to change, and the least alteration in the conditions to which they may be exposed will cause it either to germinate or perish. But when a seed is perfectly ripe its elements become comparatively stable or indisposed to change, and to induce germination is in proportion difficult, while those alterations which are succeeded by death are slow in taking effect.

Dryness in all cases, and in some a perfect exclusion of atmospheric air, are found to be the conditions upon which the preservation of life in seeds mainly depends. Some seeds will live for a long time if gathered ripe and preserved quite dry ; others will perish after a short time although kept dry, and these demand the exclusion of air in addition. Corn, pulse, and in general farinaceous seeds, belong to the former, while all oily seeds, and such as contain much tannin, are to be classed in the latter series ; apparently because of the great affinity of their compounds for oxygen. This explains why, under the same circumstances, one kind of seed will survive a voyage, and another dies. A man buys corn, peas, beans, mast, acorns, and hollyberries, and sends them to the antipodes : the first three and the last survive the voyage : the others invariably perish.

The mode of packing seeds is generally such as to render this risk greater than it need be. Half dried seeds are placed in half dry papers, and the

whole are enclosed in a tin case placed in the hold of a ship. There the temperature rises ; the dampness present favors germination ; growth commences ; all the stable chemical compounds of the seeds are suddenly converted into unstable principles, and as growth cannot possibly go on death ensues ; then follows decay.

The remedy for this is obvious enough. Great care in drying the seeds, and the papers they are packed in, and free ventilation in a cool place, such as a coarse bag suspended to a nail in a cabin, counteract the dangers to which farinaceous and similar seeds are usually exposed. But with the second class such precautions are ineffectual. For oily seeds, beech-mast, acorns, nuts, and grain of a similar nature, the exclusion of air is indispensable. The mode of securing this object is usually to enclose seeds in dry earth or sand *rammed hard* ; or in charcoal powder, the whole covered with tin or put in a stout box ; and no better common method seems to exist. It is, however, far from perfect, and therefore much disappointment occasionally attends its use.

It is worth inquiring whether all seeds would not preserve their vitality most perfectly if kept in an atmosphere of carbonic acid, which would seem likely to oppose an effectual barrier to those changes which destroy seminal life. Now that the glass-workers can do as they please, it would be easy to have bottles so contrived that after being filled with seeds their air might be exhausted and replaced by carbonic acid, which might be retained by hermetically sealing the aperture in the bottle. We trust that the experiment may have a trial, and that the result will be reported for the public benefit. If it fails the loss would be trifling ; if it succeeds the gain would be enormous, for the cost of bottles and their proper preparation would bear no kind of proportion to the value of the seeds preserved.

It is not, however, enough to pack seeds securely : it is equally necessary that those who receive them should know how to treat them. We entertain no doubt that in many cases, for what are called "bad seeds" we ought to read "bad gardeners ;" and that the want of skill on the part of those who receive seeds is at least equal to that of the senders. This is, however, a distinct question which we must reserve for a future occasion. In the meanwhile, in order to illustrate the circumstances under which the vitality of seeds is preserved accidentally for a long series of years, we cannot do better than give the substance of a statement published a year or two ago by Mr. Kemp, in the "*Annals of Natural History*" (vol. xiii. p. 89). This is one of the few instances in which the suspension of vitality in seeds for a very long period is unquestionable. This gentleman says that, having received some seeds which were found at the bottom of a sand-pit upwards of 25 feet in depth, he most carefully examined into all the circumstances of their discovery. They were first seen by a respectable workman who was excavating the finer sand at the bottom of the pit, in a part which was rather undermined ; and fortunately Mr. Bell, of Melrose, the proprietor of the place, was

looking on at the instant that they were disinterred. He kindly sent some of the seeds to Mr. Kemp, who immediately, in company with Mr. Bell, carefully examined the layer in which they had been imbedded. The seeds were apparently of only two kinds; specimens of them were sent to Professor Lindley, and the others sowed by himself. The plants reared by Mr. Kemp were ascertained by Professor Henslow to consist of *Polygonum convolvulus*, and a variety of *Atriplex patula*; the seeds planted at the Horticultural Society produced *Rumex acetosella* and an *Atriplex*. The latter was, according to Mr. Babington, exactly like a variety of *A. angustifolia*; but we regarded it as a form of *A. patula*.

The sand quarry in question is described as being situated about a quarter of a mile west of Melrose, and at the height of between 50 and 60 feet above the nearest part of the Tweed. The seeds were mingled with some decayed vegetable fibres, and formed a layer resting upon another layer, 8 inches in thickness, of fine sandy clay. This latter lay over a mass of gravel, which again rested on a great mound belonging to the boulder formation. This mound, which extends about a mile along the middle of the valley, is about 90 feet in thickness, and Mr. Kemp believes was formed by the action of glaciers. It contains enormous angular blocks of rock, and others smoothed and distinctly scored in lines parallel to their longer axes. The layer of sandy clay, on which the seeds rested, was capped by upwards of 25 feet in thickness of distinctly stratified sand, which has been largely quarried. The beds of sand vary in thickness and in fineness; sometimes they alternate with thin seams of impalpable clay, and sometimes they contain minute pebbles and fragments of carbonaceous decayed wood. The layers slope at an angle of 15 degrees towards the valley, and in this direction they thin out; the upper layers extend further into the valley than the lower ones; the entire mass has a level top, and is capped by some thin beds of fine gravel. From these several facts, observes Mr. Kemp, and from the general aspect of the layers of sand, it is scarcely possible to doubt that the seeds were deposited by a river or torrent, at the point where it entered a sheet of water. "I had long been of opinion," he adds, "that the valley of the Tweed in this part must formerly have been occupied by a lake, at a period when a great trap-dyke, 100 yards wide, which crosses the valley four miles lower down at Old Melrose, had not been worn through. By an accurate levelling I have ascertained that the layers of sand lie just beneath that level which a lake would hold if the barrier at Old Melrose were reclosed. A depression on the surface of the land can also be distinctly followed from the spot where the sand-quarry is situated, up the valley, to where it joins the bed of the existing river. I cannot doubt that the Tweed anciently flowed in this depression, and deposited on the borders of the lake the layers of sand where we now find them. It is certain that in the time of the Romans, about 2000 years since, no lake existed here; and when we reflect on the time necessary to have worn down the barrier of trap-rock and to

have drained so large a lake, which must have stood at its highest level whilst the thin layers of sand were deposited over the bed with the vegetable remains, the antiquity of these seeds is truly astonishing, and it is most wonderful that they should have retained their power of germination."

To us it appears that the circumstances which enabled them to do so were their original nature, they having belonged to what may be called the farinaceous series, and secondly the exclusion of air by the beds of sand that gradually formed over them.—(*From the Gardener's Chronicle, October, 1847.*)

ON THE PRODUCTION OF VANILLA IN EUROPE.

In marshy bushy places on this journey, I saw many plants of the *Vanilla planifolia*, seldom bearing flowers, and more rarely producing fruit. It has now been satisfactorily determined, that this is the species from which the true Vanilla of commerce is procured. In Mexico it is extensively cultivated for the sake of its fruit, which it yields abundantly: while the plants which have been introduced into the East Indies, and the hothouses of Europe, though they have frequently produced flowers, have very seldom perfected their fruit. Dr. Morren of Liège was the first to study attentively the natural history of this plant, and to prove experimentally that the fruit of the Vanilla may be as freely produced in our hothouses as it is in Mexico. He has discovered that from some peculiarities in the re-productive organs of this plant, artificial fecundation is required. In the year 1836, a plant in one of the hothouses in the Botanic Garden at Liège produced fifty-four flowers, which having been artificially fecundated, exhibited the same number of pods, quite equal to those imported from Mexico; and, in 1837, a fresh crop of about a hundred pods was obtained upon another plant by the same method. He attributes the fecundation of the plant in Mexico to the action of some insect which frequents the flower; and hence accounts for the non-production of fruit in those plants which have been removed to other countries. There can be no doubt that this plant is as perfectly indigenous to Brazil as it is to Mexico; but it is no less certain that its fruit is there seldom matured. Is this also to be attributed to the absence of the means by which nature is supposed to effect fecundation in Mexico? This is a subject which, as Professor Morren justly observes, well deserves attention in a commercial point of view, since his experiments go to prove that in all intertropical countries Vanilla might be cultivated, and a great abundance of fruit obtained.*—(*Travels in the Interior of Brazil. By George Gardner, p. 296.*)

* See Professor Morren's paper "On the Production of Vanilla in Europe," in Taylor's *Annals of Natural History*, Vol. iii. page 1.

Monthly Proceedings of the Society.

(Thursday, the 9th September, 1847.)

William Storm, Esq., Vice-President, in the chair.

The proceedings of the last meeting were read and confirmed, and the gentlemen then proposed were ballotted for and duly elected Members of the Society, viz :—

Baboo Radhanath Sikdar, Baboo Russick Krishna Mullick, Mr. J. F. Harrison, Rajah Protabhunder Sing, Baboo Prannauth Bhose, Baboo Turrucknauth Roy Bahadoor, Major R. Houghton, Messrs. R. F. Hodgson, C. S., John Barton, E. A. Russell, C. S., John C. Abbott, Baboo Neelmoney Bysack, Baboo Lal Baharee Dutt, and Capt. A. Dallas.

Candidates for Election.

The names of the following gentlemen were submitted as candidates for election :—

J. M. Vos, Esq.,—proposed by the Secretary, seconded by Mr. Staunton ;

W. Ainslie, Esq., C. S.,—proposed by Mr. H. Cowie, seconded by the Secretary ;

Baboo Shib Chunder Deb, Deputy Collector, Midnapore,—proposed by Baboo Peary Chand Mittra, seconded by Baboo Ramgopaul Ghose ;

Capt. R. Smith, Artillery,—proposed by Capt. F. C. Burnett, seconded by the Secretary ;

Capt. Kinleside, Artillery,—proposed by Capt. Burnett, seconded by the Secretary ;

Major Thomas Sewell,—proposed by Mr. W. Storm, seconded by the Secretary.

Presentations to Library.

1. The Journal of the Indian Archipelago and Eastern seas. *Presented by the Editor.*

2. The Journal of the Asiatic Society of Bengal, No. 181. *Presented by the Society.*

Garden.

1. A second assortment of flower and vegetable seeds, the produce of the public garden at Lucknow. *Presented by Capt. G. E. Hollings.*

2. A few seeds of the Genip tree (*Genipa Americana* ?). *Presented by Major Macfarquhar.*

3. A small supply of acclimated English barley, from Gya. *Presented by E. F. Lautour, Esq.*

4. A supply of Cape acorns and chesnuts. *Presented by Mr. Villett.*

5. Two plants of the "Ansenna" tree, believed to be a species of *Cassia*, and a plant of the "Tampooney," both from Penang; and a few seeds of *Cordea Sebestena* and *Hura crepitans*. *Presented by Capt. F. C. Burnett.*

6. A small batch of madder roots and some Dandelion seed. *Presented by Dr. Gibson, Superintendent H. C. Botanic Garden, Bombay Presidency.*

Dr. Gibson mentions, that he now grows a sufficient quantity of the Dandelion to supply the medical stores at Bombay with the extract.

☞ All the above seeds are available to members.

Communications on various subjects.

The following papers and letters were also submitted :—

1. From J. Thornton, Esq., Secretary to the Government, N. W. Provinces, transmitting by desire of the Lieutenant Governor a long and valuable report by Dr. Jameson on the cultivation and manufacture of tea in Kumaon and the Deyrah Dhoon.

2. From P. Melville, Esq., Under-Secretary to Government of India, forwarding by desire of the President in Council, a memoir by Mr. J. W. Masters, of some of the natural productions of the Angami Naga Hills, and other parts of Assam.

3. From G. A. Bushby, Esq., Secretary to Government of India, presenting copy of a memorandum by Dr. Royle, on the export of wheat from India to England, recently received from the Hon'ble the Court of Directors.

4. From H. Rehling, Esq., offering some remarks on the propagation of plants from leaves.

The above communications were referred to the Committee of Papers.

5. From J. H. Bridgman, Esq., of Lohra, Gorruckpore, on the subject of fodder grasses. After referring to the Angola grass, of which he is desirous of obtaining seed, Mr. Bridgman observes as follows :

"I am much interested in the introduction of good grasses for fodder for cattle, a subject which I think has not received the attention it deserves. In this district, where the climate is not very dry, and the soil at a certain depth below the surface always more or less moist, the wild grasses grow with great luxuriance; but they are all worthless as fodder; the cattle will not touch them, except when after being burned in the spring, the young shoots are just springing from the ground. The consequence is, that they are often starving in the midst of verdure. Guinea grass will not answer as a substitute, for its root is too weak and has not sufficient hold of the ground. It is consequently easily destroyed unless taken great care of, especially as the stole stands so high above the surface of the ground as readily to expose it to injury. Besides, its roots lying on the surface do not penetrate deep enough to supply the plant with sufficient moisture in the dry season, during which

though it does not die, it does not grow with vigour. The wild grasses are all deep, strong-rooted grasses. I want to discover a grass, the root of which is of the same character, but the leaf tender, sweet, and nutritious—such a grass might be employed to supplant them, and would be invaluable.”

6. From Major Jenkins, in reply to an enquiry on the subject of the *Rhæa* fibre of Assam (*Kunchoora* fibre of Rungpore), *Urtica Nivea*, and its probable identity with the grass-cloth of China. “I thought”—observes Major Jenkins—“that the plant from which this beautiful article is made, was long known to be from the leaves of some species of *Pandanaceæ*, and I am surprised to find, after all our long intercourse with China, that we are still ignorant of the plant which produces it. We had, I thought, a near imitation in the fibres obtained from the pine-apple and from a common *Pandanus*. The fibre may be obtained from the *Urtica Nivea* (our *Rhæa*), but I think it does not seem probable; for we have no instance in which any fine thread is made from it, the finest being small twine for fishing lines and nets; it is a very excellent hemp, but it appears to be quite destitute of that glossiness and coolness which are so much admired in the grass-cloth, and I should doubt that any mode of preparation would give it the appearance of grass-cloth: the leaves however of the *Bromeliaceæ* and *Pandanaceæ* yield fibres mostly like the grass-cloth, when weaved into cloths, and of which I believe you have had many samples. The Assamese, as I imagine, I must have already informed the Society, cultivate the *Rhæa* about their villages, but the cultivation is small and confined to the fishermen. The twine made for fine nets sells for about one rupee a seer—the flax is about half that price. I have two or three times sent large parcels of it home to the Society of Arts and elsewhere, but it appears not to have attracted any attention as a flax fit for fine cloths, and it was too dear as a hemp for cordage. It might however be cultivated extensively and cheaply; it requires little care, but the small plants round the villages I observe are well manured with cow-dung and ashes. If the grass-cloth is made from our *Rhæa* the process of preparation should be enquired into, our people know nothing of it. Neither do the Khamtis, Singphos or Shans, who come from the borders of China, and who all know the *Rhæa* perfectly well, make any thing resembling grass-cloth that ever I have met with.”

7. From Lieut. John Elliot, Artillery, Cawnpore,—bearing testimony, in the following extract of a letter, to the efficacy of guano as a manure for the grape vine:—“I now proceed, according to my promise, to give you the result of the use of the small quantity of guano you sent me. I applied it to two vines and a peach tree. Unfortunately, it was a very bad fruit season. My vinery which last year had some hundreds of bunches, had not this year many more than a hundred. However, the two vines to which I applied the guano had quite or very nearly as many bunches on them as all the other vines put together; about 21 in number. The peach tree bore very spar-

ingly, but it is very young, and this a bad season. It has, however, grown very strong in wood."

8. From H. Carre Tucker, Esq., announcing the loss by the wreck of the boat off Colgong, of a large supply of plants and seeds despatched by the Society under Mr. Greenfield's charge for the public garden at Gorruckpore; and requesting a duplicate supply. In reference to the resolution which was passed at the last meeting "that a charge of Rs. 1-14 per copy (the cost price) be placed on the 200 copies [of Mr. Fenwick's Hand-book of Gardening] for which Mr. Tucker has applied, and that the remaining 300 be sold at 2 Rs. a copy," Mr. Tucker thus writes:—"I have no wish to benefit at Mr. Fenwick's expense; and though I feel much obliged to the meeting for wishing to save me any unnecessary expense, I do myself the pleasure to enclose an order for 400 Rs., the full price of my 200 copies at 2 Rs. per copy. I hope the work may be useful, and do credit to the Society."

The Secretary mentioned, that he had transferred this amount at once to Mr. Fenwick. Further, that one hundred more copies of the work had been disposed of since the last meeting.

9. From H. M. Elliot, Esq., Secretary to Government, with the Governor General, intimating that the letter addressed (as agreed on at the last meeting,) to Dr. Thomson, one of the Commission proceeding to Thibet, on the subject of a certain description of Himalayan barley, had been received, and would be forwarded by the next opportunity.

10. From W. Ainslie, Esq., Secretary Branch Agri-Horticultural Society of Cuttack, announcing the receipt of fifty rupees and two silver medals, the annual donation of the Parent Society.

11. From Dr. Campbell, intimating that he has instituted an experiment on the culture of the tea plant at Darjeeling.

12. From Dr. Wight, on the culture of the American Cotton plant in India, and the proper time for sowing it in various localities.

A favorable report from the Overseer of the Nursery garden, regarding the germination of the vegetable seeds received from Messrs. Villet and Co., of the Cape, was also placed on the table.

For all the foregoing presentations and communications, the best thanks of the Society were accorded.

(Wednesday, the 11th October, 1847.)

The Hon'ble Sir J. P. Grant, President, in the chair.

The gentlemen proposed at the last meeting were duly elected Members of the Society, viz:—

Messrs. J. M. Vos, W. Ainslie, C. S., Baboo Shib Chunder Deb, Capt. R. Smith, Artillery, Capt. Kinleside, Artillery, and Major Thomas Sewell.

Candidates for Election.

The names of the following gentlemen were submitted as candidates for election :—

Major Anderson, C. B., Ishapore,—proposed by Capt. F. C. Burnett, seconded by the Secretary ;

Lieut. Staples, Artillery,—proposed by Capt. Burnett, seconded by the Secretary ;

Baboo Roy Petumber Mitter, Bhauglepore,—proposed by Mr. Speede, seconded by Col. Sage ;

Baboo Doorgachurn Some, Hooghly,—proposed by Mr. Speede, seconded by Col. Sage ;

George E. French, Esq., Rajshye,—proposed by Mr. H. G. French, seconded by the Secretary ;

Capt. G. N. Oakes, Asst. G. G. A., S. W. Frontier,—proposed by Capt. Ouseley, seconded by the Secretary ;

E. E. Dubus, Esq., of Coolbareah,—proposed by Mr. W. G. Rose, seconded by Mr. W. Storm ;

Henry C. Hamilton, Esq., C. S.,—proposed by Capt. Burnett, seconded by the Secretary ;

Charles Durrnschmidt, Esq., Calcutta,—proposed by Mr. Watkins, seconded by the Secretary ;

G. B. Vaux, Esq., Calcutta,—proposed by Mr. Speede, seconded by Mr. Storm ;

J. A. Craigie, Esq., C. S.,—proposed by Capt. Burnett, seconded by the Secretary.

Presentations to Library.

1. Journal of the Royal Asiatic Society, Vol. 10, part 2. *Presented by the Society.*

2. Journal of the Asiatic Society of Bengal, No. 182. *Presented by the Society.*

3. Journal of the Indian Archipelago, for Sept. 1847. *Presented by the Editor.*

Garden and Museum.

1. A box of peach and nectarine cuttings from Sydney. *Presented by Capt. A. P. Wall.*

The Secretary stated, that these cuttings had arrived in tolerably good condition, and been transferred without loss of time to the nursery.

2. Eight more mango grafts of superior sorts, the produce of his garden at Jungypore. *Presented by J. Maseyk, Esq.*

3. A small supply of *Granadilla* seeds (*Passiflora quadrangularis*). *Presented by Col. Sage.*

4. An assortment of anemone and other tuberous roots of ornamental plants; also a few seeds of *Victoria regia*. *Presented by R. W. G. Frith, Esq.*

5. Three grafts of the 'raspberry mango' from Bangalore. *Presented by Dr. C. T. Smith.*

6. Three ears of black barley. *Presented by Edward Lautour, Esq.* Mr. Lautour, in forwarding this barley from London by the overland mail, states that, if not already introduced, he thinks it may prove an important addition to the cereal produce of India. The yield, Mr. Lautour believes, is computed at 2,000 fold, and each ear is furnished with six instead of two rows of seed. The country it comes from is unknown. Mr. Lautour adds, he has sent a few ears to Major Napleton for trial at Bhaugleapore, and the Secretary intimated his intention of forwarding these to Capt. Hollings at Lucknow, Mr. Carre Tucker at Goruckpore, and Mr. Hamilton Bell at Agra.

7. A few raspberries, the produce of his garden at Burkhur. *Forwarded for inspection by Col. Ouseley.*

Col. Ouseley mentions, that these plants have been raised from English seed presented to him by the Society, being a portion of a supply transmitted by Dr. Royle. They have fruited very readily this year. Col. Ouseley adds, that three fine plants are now on their way down for the Society's garden.

8. A small supply of Tibetan barley, grown near Darjeeling. *Forwarded by Dr. Campbell.*

9. A quantity of tea seed from the Kumaon nurseries. *Forwarded by Dr. Jameson.*

These tea seeds are for distribution.

10. Specimens of fibres the produce of plants common at Simla. *Presented by C. Gubbins, Esq.*

11. Specimen of a new description of fibre produced by a plant common throughout the mountains of Eastern Nipal and Sikim. *Presented by Dr. Campbell.*

(Further particulars regarding the four last named presentations will be found in the body of the proceedings.)

12. Two boxes of English oat and wheat seed, forwarded by Dr. Royle from the India House, and received by the *Precursor*.

The Secretary mentioned, he had sent a moiety of this supply to Major Napleton, and portions to Capt. Hollings at Lucknow, Mr. Tucker at Goruckpore, and Major Jenkins at Gowhatti, reserving a small supply for any other members desirous of trying them.

13. A few mangosteen plants. *Presented by G. Massey, Esq.*

A beautiful collection of cut dahlias, of various colors, from the gardens of Mrs. McLeod and Mr. R. Wood, was also placed on the table; they were much and deservedly admired.

Nursery Garden—Flower show—Sugar-cane, &c.

A report from the Garden Committee was brought up. The Committee give a list of prizes for the next flower show which they suggest shall be held on the 28th instant. They state, that they have authorized the distribution of sugar-cane, commencing from the 1st instant, (there being about twenty thousand plants fit for cutting during the present month) at a charge of 30 Rs. a thousand for the China sort, and 40 Rs. for the other varieties. The Committee add that, as requested at the last meeting, they have taken into consideration the application of the garden overseer for an increase of pay ; that in reference to "his length of service, extending over a period of nine years, his steadiness of conduct during that time, his intelligence, and uniform attention to his duties, they are prepared to recommend that his salary be increased from Rs. 60 to Rs. 90 per mensem ; the additional 30 Rs. to be granted as a personal allowance."

Proposed by Mr. Staunton, seconded by Col. Sage, and resolved, that an increase of 20 Rs. be made to the salary of the overseer.

A new description of Wild Hemp from Eastern Nipal and Sikim.

A communication from Dr. Campbell, Superintendent of Darjeeling, regarding the specimens of fibre above referred to, was first submitted.

The Secretary intimated, that from the references he had made, there could be no doubt the plant in question belongs to the nettle tribe, though of what species could not be yet determined. The specimens now on the table not being sufficient to admit of a comparative trial of its strength with other fibrous materials, he had requested Dr. Campbell to send a larger supply.

Extension of Tea plantations in Upper India—Progress of the Tibet Mission.

The following interesting extracts of a letter from Dr. Jameson, Superintendent of the H. C. Botanic Gardens, N. W. Provinces, announcing the gratifying intelligence of the proposed establishment of tea plantations in our trans-Sutledge territories ; and furnishing a few details regarding the movements of the Tibet mission,—were next read. After intimating that, with the view of meeting the application of the Society for seed of *Hordeum celeste*, on behalf of the Agricultural Society of Bombay, (according to the request preferred at the meeting in August last,) he had despatched two men to Rama Serai, in the interior of the Himalayas, Dr. Jameson observes as follows :

"I have sent you by to-day's dak two parcels of tea seeds for distribution to any members of your Society who may wish to introduce the tea plant into the other mountainous districts of India. In the plains it is useless to

attempt its growth, as it will not thrive : this of course does not apply to the elevated plain of the Deyrah Dhoon where it is thriving admirably. It will no doubt be gratifying to you to learn that the Governor General has issued orders for tea plantations to be established along the whole of the mountainous part of the N. W. Frontier from the Sutledge, and the new country west of it, to the Kali, and I have received instructions to proceed in the ensuing cold weather to the new territory to select sites.

"You mention that Dr. Campbell has been successful in raising the tea plant at Darjeeling. From the accounts that I have received of the climate of that place, I doubt not but that the plant there grown will yield tea of a superior description. I have just forwarded a large supply of seeds to him. A few days ago I received a letter from one of the Tibet mission. An extract may be interesting to you. The writer says—'We left Simla on the 2nd August, and (except three halts) have been marching steadily until now (Sept. 2nd), viâ Rampoor, Wangtoo Bridge, Chunee, Lissa, Longnum, the Hungarung Pass to Lee, and across the Piti river to Nako Chango and Changrezing. From the last-mentioned place we tried to proceed by the direct route up the Para river, to Haute, but as the Chinese or their representatives said *no*, we turned up Piti and proceeded to Dankur, and shall cross the Parung Pass to the Chemoreree Lake. The season is getting so late that we shall be able to do little but move now for Leh. Our marches have been very long. Near Simla we had rain, here we are grilled, the Thermometer yesterday was very nearly 90° in a tent. At Dankur, in the limestone beds, ammonites, belemnites, terebratulæ, etc. were met with ; and on the Chinese border freshwater shells were found in the lacustrine alluvium, an interesting fact, as proving the former existence of lakes. At Dankur bricciaconglomerate is said to occur in larger quantity. Its relative position is not given, but it appears to possess mineralogical characters, very similar to a conglomerate met with in the salt range of the Punjaub, and on which the magnesian limestone there rests.'"

Fibrous yielding plants at Simla.

• The following letter from C. Gubbins, Esq., dated from Simla, forwarding specimens of certain fibrous materials, was also submitted :—

To the Secretary Horticultural Society.

Sir,—I see in the papers some mention of the flax producing *Urtica*, supposed to be the same as the grass-cloth plant of China—and that the Society is desirous of ascertaining particulars regarding it, I therefore write to inform you, that a species of *Urtica* is used by the natives of these parts for making string. The process described to me is, that the plant is cut in October and dried in the sun ; when brittle it is beaten—and the fibres separate easily.

Seeing it stated in communications to your Society that there was considerable labor required in cleaning the fibre, I made particular enquiries on this head, and as far as I can learn, there is no greater trouble in clearing the fibre of the *Urtica* when merely dried, than is experienced with the hemp of the hills which is not rotted in water.

The difference in the process would in itself point out a principal cause of the superiority of the *Urtica* material, for whatever maceration suffices to rot the woody parts, must to some degree have similar effect on the fibre.

I send you an impression of the *Urtica* leaf. The plant will readily thrive in England, as I learnt accidentally, for having desired my servants to procure me all the jungle seeds they met with, I had them planted on my arrival in England in 1841. The most thriving plants which came up were these very nettles which were thrown away.

I am making further enquiry regarding the various fibres used by the natives here.

Since I began this letter, I have been able to procure specimens, which will, I think, be valuable : I send three specimens of fibres.

No. 1, is from the rotted bark of a standard tree, with a poplar-shaped leaf, the bark is steeped in water from 6 to 7 weeks.

No. 2, is the *Cannabis sativa*, as unrotted.

No. 3, is the *Urtica*. I see it is not properly cleaned, and very probably, further cleaning might be attended with trouble. I send also two of the stalks in order that you may ascertain whether the difficulty of separating the fibre is sufficiently great to prevent its being generally used.

These nettles grow in all the spots below Simla, and even in Simla itself.

Flax also grows kindly here ; as I discovered a plant, one foot high, flowering on the 1st September. It had sprung up as a weed, on stony ground, and I make no doubt, with culture, it would be much taller.

There is, besides the three varieties of fibre, another used at the foot of the mountains, from a species of creeper, the same that is in demand, for covering native *chattahs* or umbrellas, its broad leaves are used for this purpose. I think I remember some notice of this last in one of your preceding numbers. Before I conclude, I might as well mention another Simla product, which does not seem to be generally known. It is the Cardamon plant, which has just flowered wild on the hills about my house—the seed is not yet ripe, or I would send you some.

In connection with the above communication of Mr. Gubbins, the Secretary drew the attention of the meeting to a paper drawn up by Capt. Rainey, late Asst. Pol. Agent at Subathoo, (see Journal, Vol. 1, p. 280) accompanying a net exhibited to the Society in 1841, manufactured from the stalk of a nettle common in the low valleys adjacent to Simla, and stated, that it is probably the same plant as that referred to by Mr. Gubbins. The leaves (judging from the impression) are much larger and differently formed to those

of *Urtica tenacissima*, (the *Kunchoora* of Rungpore and *Rheea* of Assam) which is supposed to be the plant yielding the fibre from which the grass-cloth of China is manufactured.

Thibetan Barley.

Another communication from Dr. Campbell, in reference to the barley noted under the head of presentations, was also read ; of which the following is an extract :—

"A few days ago, I despatched to your address by dāk banghy, a parcel containing a seer and a half of barley. Will the Society do me the favor to forward it to Capt. Barr, the Secretary to the Bombay Agricultural Society, with reference to his application for some of the celestial barley of Thibet, noted in the last month's proceedings of your Society.

"The barley now sent to you is a Thibetan grain, grown near Darjeeling. It is a very fine grain indeed, being remarkable for the thinness of its husk and the size of the grain. This applies to it generally as grown in Thibet and Sikim ; for the actual specimen forwarded is not an average one by any means—although the only one I could procure at this time. I hope shortly to send you a sample from which Captain Barr can more correctly judge of the value of the grain, but it may suit his purpose to sow this one, as the real character of the grain may be developed in the produce, although it would be more desirable to have an average sample of seed for the experiment.

"This barley is known in Nipal by the name of "*Ouah*."* It is brought to Cathmandu by the Thibetans from beyond the snows ; but it is also grown on this side of the snowy range, in the tract known as the Upper Cachar. It is of a bluish tinge, as large as English wheat, and much cultivated by the Thibetans, who make the meal into bread, and use it dry with cold water as the *suttoo* is eaten in India. The Thibetan name is '*Na*.' Whether it is the '*Hordeum caeleste*' or another variety, I have no means of ascertaining. It is grown in all parts of Eastern Thibet, and in Sikim it flourishes at all elevations, from 5000 feet to those at the foot of the perpetual snows, where however the summer heat is considerable, and the progress of vegetation more rapid than in the tropics."

Communications on various subjects.

The following letters were likewise submitted :—

1. From Major Jenkins, enclosing a note to his address from Major Hannay, announcing, that the *Rheea* (*Urtica tenacissima*) of Assam is identical with the grass-cloth plant of China.

2. From A. Seonce, Esq., forwarding a specimen branch in flower of the *Terec* of Chittagong, the tree which produces a pod yielding tannin of a very

* This is a "Newari" word, I believe.

superior description ; and regarding which some particulars were submitted at a former meeting.

The Secretary mentioned, that he had referred this fragment to Dr. McClelland, who had obligingly furnished him with the following remarks on it :—

“The Chittagong plant is very interesting, as it would appear to be an undescribed species of *Cæsalpinia*, coming very close to *C. resupinata*, Roxb., but obviously differing from this species in having spinous stipels on the upper as well as lower side of the common petiole, and supinate instead of resupinate flowers, the odd lobe of the calyx being posterior, and the stamens more wooly. It has never been introduced as far as I can learn.”

3. From F. W. Russell, Esq., alluding to his success in raising the oak in his garden at Hooghly, from seed received from the Cape. Mr. Russell says, —“of the share I kept of the acorns 76 came up ; 2 have since died, and 2 were eaten up by a bullock, so that I have now 72 plants, seedlings of various sizes, some of them more than two feet high. I therefore hope, having succeeded in carrying them *unhoused* through the rains, I may succeed in getting them so strong as to prove that oaks may be grown in Bengal ; if they do, the acorns will assist in giving what is still so much required in agriculture, namely, fodder for bullocks and cattle in the hot weather.”

4. From Robert Burn, Esq., Edinburgh, dated 5th August, requesting, in reference to his former communication, to be allowed to forward to Calcutta, to be presented to the Society, one of his cotton-cleaning machines. The following is an extract of Mr. Burn's letter :—

“I have made great improvement in the construction of the machines since I returned from Bombay, having the command of all the necessary materials and good workmen, and if I had to supply a large number I could make them for from £3 to £4 each, although at present the Railways forming here have raised the price of iron and wages greatly.

“I am fully aware of the importance to the natives of India of a machine that will last long without requiring to be repaired, and that will not be difficult to repair, and that can easily be carried about, and of which the original cost must be very small ; and to this my attention is at present turned, in the construction of machines for the Egyptian Government, differing merely in their being required for a longer stapled cotton, and to be driven by steam power, which that Government have employed me to make.”

“These machines will be worked by Mr. Crichton, who is resident in Egypt, and from whom I have received particular instructions regarding them ; to have the assistance of an able and intelligent Engineer in Egypt is of the utmost importance, and but for the liberality of the Egyptian Government it would have remained altogether beyond my reach.”

It was agreed to comply with Mr. Burn's request, and the Secretary was directed to write to him to that effect.

5. From Messrs. Smith, Huffnagle and Co., enclosing copy of a letter from Messrs. Bevan and Humphreys, of Philadelphia, regarding the despatch of a supply of Carolina paddy on account of the Government of Bengal, for trial on the Arracan coast. It is stated, that the shipment will probably be made in January next.

The Secretary mentioned, that he had forwarded a copy of this communication for the information of Government.

The Secretary further intimated that, since the last meeting, a large supply of vegetable, flower, and maize seeds had been received in most excellent condition from the Society's seedsman at Philadelphia, and that it had been very widely distributed among the members. Also, that a consignment of flower seeds from Mr. Carter, of London, had come to hand by the *Precursor*, in as good order, of which the distribution had just commenced.

For all the foregoing communications and presentations the best thanks of the Society were accorded.

(Thursday, the 11th November, 1847.)

The Honorable Sir J. P. Grant, President, in the chair.

The minutes of the last meeting were read and confirmed, and the gentlemen then proposed were duly elected Members, viz :—

Major Anderson, C. B., Lieut. Staples, Baboo Roy Potumber Mitter and Doorgachurn Some, Capt. G. N. Oakes, Messrs. George E. French, E. E. Dubus, H. C. Hamilton, C. S., Charles Durrschmidt, G. B. Vaux, and J. A. Craigie, C. S.

Candidates for Election.

The names of the following gentlemen were submitted as candidates for election :—

Wm. Anderson, Esq., Merchant,—proposed by Mr. P. Johnson, seconded by the Secretary ;

Thomas Edmond, Esq., Merchant,—proposed by Mr. P. Johnson, seconded by the Secretary ;

J. P. Hermanson, Esq., Rungpore,—proposed by the Secretary, seconded by Mr. Staunton ;

H. Monckton, Esq., Civil Service,—proposed by Mr. W. G. Rose, seconded by Mr. W. Storm ;

Henry C. Rose, Esq., Civil Service,—proposed by Mr. Rose, seconded by Mr. Storm ;

Baboo Degumber Mitter, Calcutta,—proposed by Mr. Rose, seconded by Mr. Storm ;

Baboo Isserchunder Ghosaul, Deputy Magistrate, Hooghly,—proposed by Baboo Ramgopaul Ghose, seconded by Baboo Pearychund Mittra ;

J. R. Muspratt, Esq., Civil Service, Rajshaye,—proposed by Mr. Gilson French, seconded by the Secretary ;

Dr. H. H. Bowling, Civil Surgeon, Darjeeling,—proposed by Dr. A. Campbell, seconded by the Secretary ;

Henry Swetenham, Esq., Civil Service, Dacca,—proposed by Mr. W. Storm, seconded by Mr. W. G. Rose ;

Meerza Rajah Vezaram Guzputty Rauze Bahadoor, Rajah of Vizianu-gram,—proposed by Rajah Suttchurn Ghosaul, seconded by Baboo Ramgopaul Ghose ;

John Tynan, Esq., Superintendent Salt Chokies, Jessore,—proposed by Major Birch, seconded by Col. Sage.

Presentations to Garden and Museum.

1. Three raspberry plants, the produce of his garden at Burkaghur, Chota Nagpore. *Presented by Col. Ouseley.*

2. A healthy seedling of *Colvillea racemosa*, raised from seed obtained from Mauritius. *Presented by W. N. Hedger, Esq.*

3. A supply of fresh seed of the Himalaya rhubarb, grown at Darjeeling. *Presented by Dr. A. Campbell.*

4. A quantity of Cape rye seed. *Presented by a Correspondent.* The Secretary intimated, that he had distributed portions of this seed to Major Jenkins, Major Napleton, and Mr. H. C. Tucker.

5. A small supply of tea seed, raised at Burkaghur from China stock. *Presented by Col. Ouseley.*

6. A specimen of the *Rheea* hemp of Assam. *Presented by the Asiatic Society, in the name of Mr. G. H. Grose, of Gowhafti.*

7. Specimens of wood used in the Straits for ornamental work. *Presented by E. A. Blundell, Esq.*

The following is an extract of Mr. Blundell's letter regarding these specimens :—

“Should you not have obtained any further information relative to the Penang made teapoys in the Society's rooms, which you asked me to look at some months ago, I send you a few specimens of the woods made use of for this ornamental work. You will find in the box I send you :—

1. Portions of roots and creepers as they grew.
2. Rough slices from these.
3. Planed ditto ditto.
4. Polished slices from ditto.
5. Leaves and powder used in polishing.
6. A small specimen of the inlaid work.

"The work requires considerable nicety. The pieces are fitted into each other according to the design given, kept from sliding laterally by nails, and pressed down by heavy weights. When completed, the work is planed and polished. The Chinese use oil for polishing and thin varnish, both of which tend to injure the natural colors of the woods. The specimens sent herewith, are polished with the hand, assisted with a few leaves (chiefly of the bread-fruit tree) and a powder, which is generally found in the joint of bamboos. To polish with these is the work of several days, but the colors brought out are far more brilliant and lasting than in work that has been oiled and varnished."

8. Sample of cotton from Rungpore. *Presented by Col. Sage.*

9. A few grafts of Bombay mango and of China letchees, and plants of raspberry and shaddock. *Presented by Mr. F. D'Augiar.*

A very beautiful seedling dahlia, reared in August, eleven and a half inches in circumference, and the most perfect that has yet been brought to the notice of the Society, the produce of Mr. R. Wood's garden,—was placed on the table. Three other very pretty dahlias, from Mr. George Wood's garden, were also much admired.

A list of prizes awarded at the exhibition of flowers, held on the 28th October, was submitted. It is stated, that this show was altogether about the poorest that has yet been held. The heavy showers experienced so late in the season, destroyed many sorts of annuals, and injured several kinds of perennials; consequently very few of the former were exhibited, and many of the latter were in poor condition. The collection of dahlias was however excellent, consisting of many well formed specimens, superior to any hitherto brought forward. The assortment of climbers was large, forming one-half of the number of plants exhibited. *Maurandias* were well represented; and, though early in the season, *phloxes* were submitted. The schedule comprised prizes to the extent of 150 rupees, but in consequence of the inferiority of several sorts, and the absence of others, only rupees 67 were awarded. Capt. Burnett and Messrs. Dodd and Bartlett selected the prize specimens. Mr. H. Alexander distributed the amount.

Vegetable and fruit shows.

The fruit and kitchen garden committee submitted a schedule of prizes for foreign and indigenous fruits and vegetables, amounting to rupees 133 and two silver medals. The committee recommend that the show be held on Thursday, the 2nd December—Confirmed.

Nursery Garden.

A report was also brought up from the Garden Committee, recommending the formation of additional roads in the garden at a cost not exceeding rupees 172. It was proposed by Col. Sage, seconded by Mr. Alfred Turner, and agreed, that the committee be requested to procure a ground-plan of the garden, and that their recommendation be deferred till such plan be laid before the Society.

Provision for garden and flower seeds for 1848.

The Secretary having intimated that the period had arrived when it would be necessary to determine on the amount to be reserved to meet the cost of next year's consignments of vegetable and flower seeds, it was agreed, that the sum of Rs. 4,000 be accorded for that purpose ; and that the fruit and kitchen garden committee be requested to arrange the details, and report the result to the next general meeting.

Communications on various subjects.

1. From Dr. Hufnagle, dated London, 29th August, mentioning an interview with Joseph Hume, Esq., M.P., and enclosing copy of a letter addressed to the Earl of Auckland by that gentleman, soliciting His Lordship's good offices with Lord Dalhousie in giving the patronage and support of the Government of India towards the objects of the Agricultural Society.

It was unanimously resolved, that the Secretary be requested to convey to the Earl of Auckland, to Joseph Hume, Esq., and Dr. Hufnagle, the best thanks of the Society for their exertions on its behalf.

2. From A. Shakespear, Esq., Asst. Secy. to Govt. N. W. P., intimating that the Honorable the Lieut. Governor is prepared to place at the disposal of the Society the sum of Rs. 725, for lithographing the illustrations of Dr. Jameson's report on the culture and manufacture of tea in Kumaon and Deyrah Dhoon.

Resolved,—That the best acknowledgments of the Society be tendered to His Honor the Lieut. Governor, for this liberal grant.

3. From the same, stating that the Lieut. Governor has been pleased to subscribe for 24 copies of Fenwick's "Hand Book of Gardening" for the use of the Govt. colleges and schools of the N. W. Provinces.

4. From Major Napleton, acknowledging receipt of a large supply of American vegetable, flower, and maize seeds, and of English wheat and oat seeds, forwarded by the Parent Society for the use of the Bhaugleporc Branch garden.

(Thursday, the 9th December, 1847.)

William Storm, Esq., Vice-President, in the chair.

The minutes of the last general meeting were read and confirmed, and the gentlemen proposed on that occasion were duly elected Members, viz :—

Messrs. Wm. Anderson, Thomas Edmond, J. P. Hermanson, H. Monckton, C. S., Henry C. Rose, C. S., J. H. Muspratt, C. S., Henry Swetenham, C. S., John Tynan, Baboos Degumber Mitter, and Isserchunder Ghoseul, Dr. H. H. Bowling, and the Rajah of Vizianagram.

Candidates for Election.

The names of the following gentlemen were submitted as candidates for election :—

H. Doveton, Esq., Deputy Magistrate, Bhaugleporc,—proposed by Mr. Wm. Duff, seconded by the Secretary ;

W. M. Floyd, Esq., Civil Service,—proposed by Mr. W. G. Rose, seconded by Mr. W. Storm ;

Dr. Charles Palmer, Officiating Civil Surgeon, Hooghly,—proposed by Mr. F. W. Russell, C. S., seconded by the Secretary ;

Baboo Eshanchunder Bhose, Merchant,—proposed by Baboo Ramgopaul Ghose, seconded by Baboo Pottit Parbun Sen ;

Edward Haworth, Esq., Dacca,—proposed by Mr. W. Haworth, seconded by Mr. Alfred Turner.

Presentations to Garden and Museum.

1. Three healthy plants of the Sydney peach. *Presented by Capt. A. P. Wall.*

2. Larger specimens of the “Pooah” fibre of Darjeeling, of which a small sample was submitted at the October meeting. *Presented by Dr. A. Campbell.*

3. A coil of rope made from the bark of the *Oadal*, (*Sterculia vilosa*.) *Presented by Major Jenkins.*

The Secretary having mentioned that Capt. Thompson had most obligingly offered to institute experiments on any fibrous materials, which might be brought to the notice of the Society, it was agreed to refer the above to that gentleman, with copies of Dr. Campbell's and Major Jenkins' notes on them.

4. Specimen of red-wood (name unknown), and several pieces of the Toko palm, (*Livistona Jenkinsii*.) *Presented by Major Jenkins.*

Major Jenkins states, that the red-wood (which he considers to be a species of *Acacia*) is a product of the Goalpara forests (Garrow hills). Capt. Reynolds, who presented it to Major Jenkins, reports it to be common, and

has promised to give further information about it. Major Jenkins adds, that the wood of the Toko palm, cut into pieces and well polished and mounted, makes very pretty walking sticks ; some that he sent to England were very much admired.

Provision for Vegetable and Flower Seeds, and Fruit Stones, for 1848.

The following report from the fruit and kitchen garden committee, regarding consignments of seeds for the next year, was first read :

In accordance with the resolution of the last general meeting,—“that the sum of Rs. 4,000 be accorded for next year’s consignments of seeds, and that the fruit and kitchen garden committee be requested to arrange the details, and report the result to the next general meeting,”—your committee beg to state the mode in which they have endeavoured to meet the wishes of the Society, at their sitting held on the 29th November.

Vegetable Seeds from the Cape.—The consignment of vegetable seeds received this year, from Messrs. Villet of the Cape, having proved, so far as they have been able to ascertain, equally as good as last year, your committee have agreed to indent for 450 packets, and have allowed Rs. 1,350 for the purpose.

Vegetable and Flower Seeds from the United States.—Owing to the disappointment experienced in 1846 by the members, in consequence of the loss of the American seeds by the wreck of the *Arragon*, your committee ordered out a larger supply from Messrs. Landreth, of Philadelphia, for the present year. Though these seeds have proved equally as good as heretofore, your committee are not prepared to recommend so large an indent for the next season, but have ordered fully sufficient to meet the wants of subscribers, viz. 400 packets of vegetable and an equal number of flower seeds. For this consignment they have reserved Rupees 1,600.

Flower Seeds from England.—A doubt having been expressed by a member at the last meeting in regard to the quality of the flower seeds, forwarded by Mr. Carter, of Holborn, by the October Steamer, your committee have been at some pains to ascertain the fact by reference to several of the resident members. They have now the pleasure to mention that, with two exceptions, all bear witness to the goodness of the majority of the varieties supplied. Taking this into consideration, as also the fine collection forwarded, and the readiness of Mr. Carter to meet the wishes of the Society in every respect, your committee have not only authorized the payment of his bill of £60 (Mr. Carter agreed to forfeit the cost of the consignment, if the seeds were not approved of,) but have agreed to indent for a further supply to the extent of Rs. 800, on the understanding that 400 packets be furnished, each packet to contain 50 varieties, according to the list annexed. Mr. Carter has agreed to pack the *whole* supply himself, as is done by Messrs. Villet and Landreth, saving thereby the necessity of sending out the varieties in *bulk*,

and consequent exposure to the atmosphere, previous to sowing. On the last occasion only one-half the quantity was packed in London. This consignment will be sent by the overland route to reach its destination the first week in October ; it will include seeds of the latest gathering, as on the last occasion.

Fruit Stones from England.—In addition to the above, your committee have ordered Mr. Carter to send a supply of fruit stones of sorts, and a small assortment of dahlia bulbs, the former for distribution among the members, the latter for trial in the Society's garden. For this purpose they have reserved the sum of Rs. 250.

The several indents will therefore amount as follows :—

From the Cape for vegetable seeds, as per list annexed	Rs. 1,350
From America for vegetable and flower seeds, as per list annexed	1,600
From England for flower seeds as per list annexed	800
From ditto for fruit stones and dahlia bulbs as per ditto	250
	<hr/> 1,050
	Rs. 4,000

independent of freight, insurance, packing charges, &c.

(Signed) W. G. ROSE. J. W. LAIDLAY.
 „ W. STORM. G. T. F. SPEEDE.

The report of the committee was confirmed.

Show of Fruits and Vegetables.

A list of prizes, amounting to Rs. 128, which were awarded at an exhibition of vegetables and fruits held on the 2nd December, was next submitted. The following are the remarks appended to the list :—

“Considering the general backwardness of the season, consequent on the unusually heavy falls of rain experienced in the early part of last month, this show may be regarded as a very fair one, and certainly superior to that held on the 3rd December of last year. The display of cauliflowers, of peas—the early Prussian and other sorts,—of endive, (well blanched) nolehole, turriips, onions, leeks, and turnip-radishes, was excellent. There were also several baskets of water-cross, horse-radish, lettuces of kinds, and beans. The potatoes were, however, so very indifferent that prizes were altogether withheld from the owners.

“In the fruit department, oranges and sapotas were well represented ; the finest specimens of each, better perhaps than any yet exhibited in the Town Hall, were from the garden of a gentleman at Howrah. Many bunches of plantains of the better descriptions were brought forward ; also several good looking pine-apples, custard-apples (both out of season), and pummelloes.”

Messrs. Rose, Speede, and Laidlay selected the specimens. The prizes were distributed by William Storm, Esq., Vice-President.

Communications on various subjects.

The following letters were also submitted :—

1. From H. Hamilton Bell, Esq., dated from Omeghur, near Agra, on the subject of cotton cultivation in the N. W. Provinces, and the manufacture of an improved machine for divesting the wool from the seed.

2. From John Stikeman, Esq., Secretary E. I. and China Association, acknowledging the receipt of two cases of *Mowah* oil,—which were forwarded by the Society in April last, at the request of Mr. C. B. Taylor, of Palamow, for an opinion as to its applicability for conversion into candles and soap,—and promising it shall have immediate attention.

3. From Major Jenkins, dated Gowhatti, 24th Nov. After acknowledging the receipt of supplies of seeds sent by the September and October Steamers, Major Jenkins observes as follows :—

“ I should be obliged if in the next Steamer you could send me a bag of the seed of the *Sunn-pat* ; our people have not yet introduced it, and are indebted to Rungpore for the whole of the *Pat* used by them. There are, I think, two or three kinds of *Sunn*. I should like to get all the varieties. Hitherto the great expense of *dāk banghies* (which besides could never be trusted in the rains), and the very great uncertainty of the Insurance boats, has prevented our importing many seeds on the large scale, but now we have a steamer I shall be greatly obliged by your sending me any seeds that you may have in excess, and think would be useful to us ; for instance, if by the time this reaches you, you should have any packets remaining of English garden or flower seeds—which it will be no use your attempting to keep—I shall be very much obliged to you for them to send to Bootan ; for the season there, they will be just in time, and the chiefs are constantly sending to me for *Bilattee* seeds, (they appear particularly anxious for flowers,) and I have no means of obliging them.

“ Could you get me between this and March a good stock of *Jowar* and *Bajra* seeds ? These plants, I think, might be readily introduced—our dry lauds suit them admirably, but we have only a specimen plant here and there that the Hindoostanee Sepoys have introduced.

“ We are greatly in want of most of the ordinary country vegetable seeds, *Saugs* and *Turkarrees* of all kinds, and should you be able to furnish me with a parcel occasionally from Bhauglepore or Lucknow, I shall be much indebted to you ; the commonest seeds of all kinds.

“ This is about the worst climate in India for preserving seeds, we are constantly obliged to renew every thing—a storm comes on frequently in the spring which destroys all the plants set aside for seed.”

The Secretary intimated, that he had already prepared such seeds for Major Jenkins—(country vegetable, and *sunn, jute, jowar, bajra, &c.*) as were in store ; and had addressed Major Napleton and Capt. Hollings for further

supplies of certain sorts from Bhauglepore and Lucknow ; further, as there was a small surplus stock of American vegetable and flower seeds, he proposed including a moiety thereof in the same despatch. This suggestion was unanimously agreed to.

4. From Col. J. R. Ouseley, intimating his ability to supply thousands of fine young plants from the tea plantation at Burkaghur, which is progressing most satisfactorily. Col. Ouseley expresses his wish to procure the services of a good tea manufacturer, to whom he would be happy to pay a moderate salary. In another note Col. Ouseley mentions,—“ I have English gooseberry plants growing beautifully. The filbert also ; and from 150 to 160 walnut trees ; one, 15 or 20 feet high, and the rest under ten feet, from Cabul seed. The sugar-cane I got from the Society is thriving most capitally of two kinds, thick and thin.”

The Secretary mentioned, that Col. Ouseley had most obligingly sent the Society a good quantity of tea seed (from China stock), the produce of the above-named plantation, and had promised a further supply ; any members, or others desirous of introducing the plant into their respective districts, can therefore be furnished with seed from this stock.

5. From H. Cope, Esq., soliciting on behalf of the Archaeological Society of Delhi, to be furnished with copies of certain vols. of the Transactions and numbers of the Journal of the Agricultural Society, to complete the series for their library.

The Secretary was authorized to comply with this requisition.

In connection with the above request, Dr. Mouat stated, that he had been asked by the Royal Librarian at Berlin, to procure for him copies of the publications of scientific Societies in India for the King's Library, and that he should be happy to reciprocate the favor in such manner as may be desired. Dr. Mouat accordingly moved, that a complete set of the Journal of the Agricultural Society be transferred to him for the above purpose. The proposition was seconded by Col. Sage, and unanimously agreed to.

Letters were also read from R. Montgomery, Esq., C. S., Cawnpore ; D. F. McLeod, Esq., C. S., Benares ; and Major Napleton, Bhauglepore ; acknowledging receipt of large consignments of vegetable, flower, maize, &c., seeds forwarded for the use of the public gardens at those stations. Mr. McLeod states, “ we have now got a very steady European invalid soldier, who was brought up as a market gardener, in charge of our garden and nursery. We are enlarging our grounds, collecting supplies of seeds, plants, shrubs, trees, &c. from all quarters whence available, so that I hope we shall henceforth progress, and be able to effect something towards disseminating through these parts, an appreciation of the value of Agricultural and Horticultural improvements, and a taste for their more systematic culture. We have already got a considerable variety of indigenous and exotic plants of all sorts, and with the continued aid of kind friends, especially of yourself, I

trust the Institution will assume an importance suitable to the position we hold at the head-quarters of Hindooism, and the metropolis of wealth and dignity as regards central Hindoostan." Mr. Montgomery observes,—“our garden consists of about 30 acres of land, and is stocked with a large number of fruit trees, but as it has been in existence only for about a year and a half, they have not yet begun to bear. I have every hope of its permanency from the fact of its being worked by convicts, and therefore independent of subscriptions, which at a large military station of this kind must be constantly fluctuating.” Major Napleton reports, that he has distributed the supply of cereal grains sent to him, (which were received from Dr. Royle at the India House) to about a hundred persons, reserving a portion for the Branch Society’s experimental garden, where they have germinated most readily. “The bulk of the packets”—adds Major Napleton,—“have been sent to Tirhoot and other districts, with a particular request, that the result of the sowings may be reported at harvest time.”

At the close of the meeting, the Secretary brought to notice a communication from a member, who had lately rejoined the Society, expressive of his opinion, that his admittance fee should be remitted. The Secretary intimated, that on a rather recent occasion, viz. at the meeting held in May,—a similar request had been preferred by another member. He had then mentioned that there was no rule of exemption, and the meeting were of opinion, that it was not expedient to make one; nevertheless he thought the subject deserving of further consideration. After a brief discussion, the following notice of motion, for the next meeting, was given by Dr. Mouat, seconded by Col. Sage :—

“That any member retiring from the Society be exempted from the payment of a second admittance fee on re-election.”

For all the above communications and presentations the best thanks of the Society were accorded.

*Report of the Agricultural and Horticultural Society of India,
for the year 1847.*

It is gratifying, at the close of another year, to be able to announce, that the Society continues to prosper, both as respects the accession of members, and the improvement of its finances.

The number of elections during 1847 has exceeded any one of the three preceding years. Sixty-two new names have been registered, and the Society can now show a longer list of members than it has possessed at any previous period. The losses from death and resignations have been fully equal to last year. There have been fourteen deaths, thirty-one resignations, and five struck off for non-payment of subscription; making in all fifty.

The distribution of the members, as they now stand, may be referred to the following classes :—

	In 24 former years.	In 1845.	In 1846.	In 1847.	Gross Total.	Total real number at the close of 1847, after deducting lapses.
Honorary Members,	11	0	1	0	12	10
Free Members,	2	0	0	0	2	2
Corresponding Member,	0	0	1	0	1	1
Civilians in the service of Government,	223	9	13	15	260	170
Merchants and Traders,	186	15	14	12	227	137
Indigo and other Tropical Agriculturists,	188	2	15	6	211	93
Military Officers,	147	13	10	11	181	103
Medical ditto,	78	2	0	2	82	21
Asiatics,	57	6	2	14	79	46
Clergy,	13	1	1	0	15	4
Law Officers,	38	2	1	0	41	23
Miscellaneous,	9	0	0	2	11	8
	952	50	58	62	1122	618

If from this return of 618 members, thirty-six who have compounded for their subscriptions be deducted, with ten honorary, one corresponding, and two free members, also 125 absentees, there will

remain as the actual number of paying members on the strength of the Society, 444.

The following are the members whose demise the Society is

Economy of the Society—Necrology. called on to record, viz :—
Col. Speirs, Resident at Nagpore; Baboo Connyeloll Tagore, of Calcutta; Lieut. Chas. Scott, Political Assistant, Assam; Mr. A. G. Glass, Merchant, Calcutta; Mr. P. Barron, of Shajehanpore; Mr. C. T. Sealy, Civil Service; Mr. R. Richardson, Civil Service; Mr. Gilson Rowe, Indigo Planter, Jessore; Mr. Owen Potter, Merchant, Calcutta; Mr. W. Macdougall, Indigo Planter, Bogra; Capt. Clapperton, Master Attendant, Calcutta; Capt. John Gilmore, Engineers; and Mr. A. Dick Cunyngham, Civil Service.

The Society refers with satisfaction to the fact that the call made in its last report on the native members of the community has been readily responded to. On that occasion it had to complain of the apparently little degree of interest exhibited by this section in regard to its operations generally. It has now the pleasure to mention, that nearly one-fourth of the members elected during the year belong to this class, who now form about one-twelfth of the total number of members. Though this proportion is small, considering the number of educated and wealthy native gentlemen resident in the city in which this institution holds its meetings, and transacts its business,—yet the Society indulges the hope, now that the apathy, which previously existed, is wearing off, that many others will follow the example, and that the native community will continue joining its ranks till they equal in number the other members.

From the Military branch of the Government Service generally, the Society continues to receive a cordial support. But it observes, with regret, the comparatively small number of medical officers on its list, either as subscribers or correspondents; for, from the leisure which many possess, and their attachment to scientific pursuits, they might contribute much valuable information on various subjects connected with the Society's enquiries, of which our knowledge is at present limited.

Economy of the Society—Support from native members of the community.

Economy of the Society—Call on Medical Officers of Government.

With the Branch Associations established in various parts of the country, the Society has maintained an active and profitable intercourse during the year. That at Bhaugleppore, which was formed in 1843 by its present zealous Secretary Major Napleton, numbers rather more than 300 members, and is now, it is hoped, established on a sufficiently sure foundation, to be unaffected by those changes which have in past years proved fatal to the existence of several other branches. This Society, apart from the independent share it takes in encouraging the introduction of useful and ornamental cultures over all parts of the province of Behar, by its periodical exhibitions and other means, renders additional aid to the parent institution as providing a fitting receptacle for seeds of particular descriptions which are considered worthy of introduction, with a view to their general dissemination throughout that portion of India. The fine white linseed and cereal grains of the Nerbudda valley may be referred to as illustrative of this remark. These superior products were first brought to the notice of the Society three years ago, by Col. Ouseley, the Commissioner of Chota Nagpore. A portion of the seed then presented was transferred to Major Napleton, the various sorts were carefully tried in the branch garden, and distributed to certain zemindars, by whom all kinds, but especially the *white* linseed (which was previously unknown in Behar and Upper India) were much appreciated. From this small beginning an useful plant has been fairly introduced, and taken firm root in various districts where, formerly, the *brown* description was only grown.

The same observation applies to the Branch Society and Garden at Lucknow, which is still under the able management of Captain Hollings.* At the suggestion of that zealous Officer the Society awarded in March a silver medal to Nund Loll Misr, (an inhabitant of the town of Mynpooree, in the Doab) Darogah of the public garden, in testimony of his successful exertions in the cause of Agriculture and Horticulture.

* While this summary is going through the press, the Society has received an interesting and most satisfactory report from Captain Hollings, descriptive of the present state of the garden under his charge.

The Society is happy to announce the resuscitation of the public Garden at Berhampore, and the formation of one at Cawnpore. The old garden in the first named locality being too far removed from the station to be easy of access, a new site, close to cantonments, has been selected; and, under the fostering care of Mr. R. F. Hodgson, the Magistrate, and a few other zealous horticulturists, has been already well stocked with useful and ornamental plants. It is proposed, shortly, to introduce periodical exhibitions of vegetables, fruits, and flowers, after the manner observed by a few other Branch Societies. The garden lately established at Cawnpore, consists of about 30 acres of land, and is already adorned with a large number of fruit trees. Being worked by convicts, it is in a great degree independent of subscriptions from the public which, at a large military station, must be always fluctuating. Having this great advantage, every hope may be entertained of its permanency. The main object in the formation of the garden is "to improve the horticultural products of the district by raising and distributing good fruit trees and vegetable seeds among the gardeners and cultivators; and the second object is to make the garden partly support itself by the sale of good vegetable produce."

The public garden at Benares, to which allusion was made in the last summary, is progressing favorably. The grounds have been enlarged, a considerable variety of indigenous and exotic plants introduced, and collections are being made from all quarters where available. To all these gardens, and to those at Hooghly, Mirzapore, Gorruckpore and Cuttack, the Society has distributed seeds and plants, as also money and silver medals to such branches as have applied for them.

The nursery of the Society has met with due attention at the hands of the garden committee. A tolerably large supply of ornamental plants has been distributed to members from the spot set apart last year as a flower garden. The distribution of fruit tree grafts of the best descriptions has commenced on a small scale, to be increased every succeeding year. Applications for guinea grass, arrowroot, ginger, tapioca, tobacco seed, and other useful cultures have been most liberally attended to. The demand for sugar-cane

Nursery-Garden—
Agri-Horti. and Flo-
ricultural Depart-
ments.

has, unfortunately, been small compared with last year, though the cultivation has been equally extensive. Not more than ten thousand of the present season's crop (1847-48) have yet been disposed of. That this portion of the nursery has, however, been usefully employed since its formation, eight years ago, may be gathered from the fact that the total amount of cane sent out during that period, over all parts of the country, has exceeded two hundred and twelve thousand.

The propriety of endeavouring to establish, in connection with Nursery-Garden— the nursery, a school for gardeners, to aid in School for Gardeners. meeting, in the course of time, the frequent applications from non-resident members for men whose services can be better depended on than those who are now sent frequently, and of necessity, on the recommendation of one of their own class, into the interior, has more than once occupied the attention of the committee, though they have not previously been able to carry their wish into effect. It is now gratifying to mention that such a school has been established. It has, however, been commenced on a small scale, the numbers being limited to twelve; to be increased at any future time, should the result of the experiment warrant it. Boys have been hired for the purpose, in preference to men, to avoid encountering the prejudices generally entertained by adults against a system of gardening differing, in many respects, from that to which they have been accustomed. But the committee have intimated, that they have no wish to exclude from the school any *mallee* who may be desirous of learning the principles of his art and to read and write; but that these men must not expect to receive a higher rate of wages than that allowed to the common laborers in the Society's employ, until such time as they may be considered sufficiently advanced to be recommended as gardeners to members or others applying for their services.

The Society would take this opportunity of acknowledging its obligations to all those who have contributed plants and seeds to its garden during the past twelve months, and of requesting a continuance of such aid. It is especially indebted to Capt. A. P. Wall, for plants of the Sydney peach and nectarine; to the Rajah Sutt Churn

Nursery-Garden—
Acknowledgment of
donations.

Ghosaul, a Vice-President, for mango grafts; to Col. Ouseley for raspberry plants and seeds of sorts; to Mr. W. Stalkart for cuttings of his fine purple and white grape; to Dr. Hufnagle for plants of the bread-fruit tree; to Mr. F. W. Russell,* C. S., for oak seedlings; to Mr. Maseyk, of Jungypore, for mango grafts of a superior sort; to Mr. Manley for a collection of *pelargoniums*; and to Messrs. Massey and Homfray for mangosteen plants.

It only remains to add, under this head, that a well surveyed ground-plan of the garden is now being prepared, and that a deep ditch is being excavated the whole length and breadth of the boundary, with the view of more effectually protecting it against the inroad of cattle.

The Society has bestowed its usual support in the departments of horticulture and floriculture. Three exhibitions of fruits and vegetables have been held during the year, namely, in February, May, and October, at which, prizes to the extent of Rs. 344 and two silver medals were awarded. The experiment of substituting quarterly for annual exhibitions, which was commenced four years ago, continues to work well. There is no doubt it has already stimulated the native gardeners to additional exertion, and is producing the desired effect of bringing many vegetables earlier into the market and retaining them longer in season. It has been resolved to have fewer prizes, but of larger amount, for the future, and to award more silver medals for certain rarer kinds of vegetables and fruits.

Four shows of flowers have taken place during the same period, in February, April, October, and December. The amount bestowed as prizes on these occasions has aggregated Rs. 369, for which, as heretofore, the Society is indebted to the liberality of Sir Lawrence Peel, a Vice-President. These shows were commenced in 1845, and the progress that has been made during the last three years may, on the whole, be considered satisfactory. Yet it cannot be denied that the competition, though greater than in 1846,

* Mr. Russell has been most successful in raising the oak in his garden at Hooghly, where he has now seventy healthy seedlings, some more than ten feet high.

is less spirited than could be desired. The number of competitors at each show may be estimated at thirty, while the prizes have been confined, on an average, to the produce of about twenty gardens.

As regards its annual supply of imported seeds, the Society has been more fortunate this year than the last. The consignment of vegetable and flower seeds from the United States, has afforded general satisfaction. This remark is equally applicable to the assortment from the Cape. The experiment of procuring a consignment of flower seeds from England, by the overland mail, later in the season, with the view of enabling the seedsman to give a supply of the latest gathering, has proved sufficiently successful to induce the Society to sanction a similar order for the consignment of 1848. This result is the more satisfactory, since every previous supply from England had failed to germinate. The consignment above referred to reached its destination the first week in October; one-half was packed by Mr. Carter, the other half was despatched *in bulk* and subdivided on arrival. But with the view of preventing that exposure to the atmosphere which this subdivision necessarily entails, Mr. Carter has been requested to pack the *whole* of the next supply previous to transmission. If this request be strictly attended to, nothing more, the Society thinks, can be desired to render the consignment every way acceptable. It may perhaps be as well to record in this place,—since an opinion is entertained, in more than one quarter, that packing in tin is very injurious to the vitality of seeds,—that the above-mentioned supply was placed in boxes *lined with tin*, and made air-tight by being carefully soldered. In this respect Mr. Carter has followed the mode adopted by the Society's seedsmen at the Cape and Philadelphia, whose consignments have seldom failed to give satisfaction.

An application was preferred last year to the Court of Directors, through the local government, for a supply of cereal grains and other seeds of an useful character, similar to that received in 1845; this request has not yet been responded to. A few small assortments have, however, been forwarded by the overland mail from the India House, and these have been judiciously dis-

Horticultural department—Imported vegetable and flower seeds.

Agricultural department—Cereal grains, tea, coffee, rhubarb, and forest tree seeds.

tributed. Through the liberality of a few of its members the Society has likewise had an opportunity of disseminating certain other sorts of seeds to applicants. From Col. Ouseley, supplies of tea and coffee seed from his plantation at Burkaghur, (Chota Nagpore) have been received and distributed in quarters where they are likely to be appreciated.* By the kindness of Dr. Jameson, Superintendent of the Botanical Gardens, N. W. Provinces, the Society has been in a position to meet demands—now pretty frequent—for *Coniferae* and other Himalayan seeds, for despatch to Europe; that officer has also supplied a quantity of tea seed, the produce of the Government nurseries in Kumaon and Gurhwall. To Dr. Campbell, the Superintendent of Darjeeling, the Society is indebted for a supply of rhubarb seed raised in that locality from Europe seed. The plant has been cultivated for some time by Dr. Campbell, but he has not been able, before this year, to obtain any seed. To Mr. Russell, for a large quantity of Cape acorns, portions of which have been transferred to the gardens at Bhauglepore, Lucknow, and Saharunpore. These gardens have, in return, contributed supplies of acclimated vegetable and flower seeds. American maize of superior kinds has also been scattered over various parts of the country.

And here it may not be out of place to allude to a communication from Mr. Sconce, the Collector of Chittagong, bringing to notice the pod of a tree common to the jungles of that province. Agricultural department—Valuable tanning substance from Chittagong. Mr. Sconce was induced to send a quantity of these pods to the Society under the impression, from the similarity of the tree which produces them to the American Sumach, (*Cæsalpinia coriaria*,) that they too would be found to afford a good tannin. The result has fully justified his anticipation. Mr. Teil (to whom the Society awarded its gold medal in 1846, in appreciation of his services in.

* In a letter addressed to the Secretary in the early part of the year, Capt. Hollings, alluding to one description of the cereal grains presented by Col. Ouseley, in 1846, remarks—"the wheat grown from the Hoosungabad seed, in a field partially manured with oil-cake, appears to be very fine, and although the stalks are unusually long they are strong, and the ears fuller and heavier than any formerly produced in this part of India."

having so satisfactorily tested the property of Indian-grown American Sumach) has reported most favorably of it; leather tanned by it being stated to possess "not only an equality in softness with that tanned by Dividivi, but surpassing it in color and appearance." Mr. Teil further gives it as his opinion,—the opinion of a practical tanner—that "it is consequently capable of being used far more extensively for tanning purposes, especially when a bright color is required, than the Dividivi:"—and he adds—"if therefore it can be extensively grown, not only at Chittagong, but also in other parts of the country at a moderate expense, I feel confident it would become an article of considerable demand in foreign markets, besides being extensively used in this country." The quantity placed at Mr. Teil's disposal was too small to admit of his carrying out a series of comparative experiments with this product and other tanning substances, but this he will be able to effect in the early part of next year, when Mr. Sconce has promised to send a much larger supply of the pods. The tree in question, which is called *Teree* by the natives of Chittagong, appears to be unknown on this side the Bay; but from the facility with which a number of individuals have been raised from seed at the Society's nursery, there is little doubt it could be readily introduced all over Bengal, should subsequent enquiries prove that it is not indigenous.*

In the circumstance above noted, we have another instance of our imperfect knowledge of the vast vegetable resources of India, notwithstanding the various works and useful reports that have been published from time to time on the subject of its botany and agriculture. We have here brought to notice an indigenous substance,

Agricultural department—The Valonia of Darjeeling.

* Dr. McClelland, Officiating Superintendent H. C. Bot. Garden, Calcutta, to whom a flower and leaves of the *Teree* were lately referred, makes the following observation on it:—"The Chittagong plant is very interesting, as it would appear to be an undescribed species of *Cesalpinia*, coming very close to *C. resupinata*, Roxb: but obviously differing from that species in having spinous stipels on the upper as well as lower side of the common petiole, and supinate, instead of resupinate flowers, the odd lobe of the calyx being posterior, and the stamens more woolly. It has never been introduced as far as I can learn."

which apparently has never before attracted attention, but which, in all probability, will be found an excellent and cheap substitute for articles hitherto procured from Europe and America. In a report like the present, it would be out of place to enter upon any lengthy dissertation on the many vegetable products of India which, at present scarcely known or neglected, might probably, by the bestowal of a little skill and capital, be added to our list of export articles; but it may not be amiss, before quitting the subject, to draw attention in a few lines to another tannin yielding substance which was last year brought to the notice of the Society by Dr. Irvine, in his interesting report "on the resources and products of Darjeeling." In that report Dr. Irvine alludes to the existence, in the forests of Darjeeling, of several species of oak affording *valonia* in large quantities, of a quality fully equal to that of Smyrna. At present the European tanners of this city obtain this valuable product from a foreign market, at no little cost, and without the certainty of its arrival in good condition; whereas, it appears, that the same article could be readily procured, for a comparatively trifling sum, at no greater distance from Calcutta than 400 miles!

The museum has been enriched during the year by several useful contributions. It is unnecessary to allude to them here in detail, their receipt having been duly acknowledged in the monthly reports; but it may be as well to refer to a few of the more valuable ones. To Majors Jenkins and Hannay the Society is indebted for further specimens of the timber trees of Upper Assam, and to the latter Officer for a second valuable report on the subject; to Mr. Joseph Agabeg, of Calcutta, for two handsome tables, inlaid with various kinds of wood, the produce of the Straits; and to Mr. Blundell, C. S., for various specimens of wood from the same locality, employed for the same manufacture; to Mr. C. B. Taylor, for a large supply of *Mowah** oil (*Bassia latifolia*);

* Mr. Taylor sent down about 6 maunds of this oil. It has been transmitted in equal quantities to the Secretary of the E. I. and China Association, to the Society of Arts, and to Professor Royle, with the view of having it fairly tested as a fit ingredient for candle and soap manufacture, or for any other useful purpose.

to Mr. B. H. Hodgson, for specimens of Tibetan wool, illustrative of a short paper on the subject; to Dr. Campbell, Supt. of Darjæling, for a new sort of fibrous material called "Pooah"* by the Parbutteas, the produce of a plant which "grows wild and abundantly in the valleys throughout the mountains of eastern Nipal and Sikim, at the foot of the hills skirting the Tarai to the elevation of 1,000 or 1,200 feet, and within the mountains up to 3,000 feet"; and to Major Bogle, Commissioner of Arracan, for a few skeins of silk produced in the southern part of the Sandoway district, not far from the Burmese town of Bassein. This silk, which is not the produce of the mulberry worm, is so well thought of by the Society's silk committee, that Major Bogle has promised to procure further and fuller information regarding it.

The Society reiterates the call made in the last report for further contributions towards this department of vegetable and mineral products. It would more particularly ask for specimens from all parts of the country of gums, gum-resins, vegetable oils, tanning and dyeing substances, fibrous materials, wild silks, and grains of sorts. Furnished with convenient apartments, it is now in a position to make a satisfactory arrangement of all such contributions, and will use every means to procure information as to the relative values and properties of the different articles placed at its disposal.

It was stated in the summary for 1845, that the offer of H. C. Tucker, Esq., C. S., through the Society, to award the sum of Rs. 300 and a gold medal to the author of a good Hand-book of agriculture, horticulture, and farming, in the vernacular (Ordo and Persian character,) had been successfully responded to by Mr. H. Fenwick, of Calcutta. It may now be added, that the work has been published at the expense of the Society, and that it intends transferring the entire proceeds of the first edition, consisting of 500 copies, to the author. Mr. Tucker, not content with his original donation, has, in addition, most liberally taken 200 copies for distribution throughout the district under his charge. The Govern-

* This fibre has been transferred for examination and report to a gentleman who has had much practical experience with such articles.

ment of the N. W. Provinces has likewise subscribed for 24 copies for the use of certain Schools and Colleges in Upper India. The Branch Society at Cuttack, and several members, have also taken copies, leaving less than one-fourth of the entire edition unappropriated. This ready demand for a work which, it was the opinion of many, would long remain on hand, is encouraging, inasmuch as it shows the interest taken in the important objects on which it treats, and further holds out a prospect of equal success in the disposal of an edition in Bengallee, for which, the Society is informed, a wish has already been expressed in more than one quarter.*

The state of the rice cultivation of Arracan, and the benefit likely to be derived from the introduction of superior varieties, and from an improved mode of preparing the indigenous sorts for foreign markets,* have been one of the subjects that have engaged the attention of the Society during the past year. The Society has received intimation that the large supply of Carolina paddy, which it ordered at the close of 1846, at the requisition of the Government of Bengal, will probably be shipped from Boston in January next, admitting of its arrival at this port in excellent time for trial on the Arracan coast during June, which month is considered the best period for sowing this variety.

On another important matter, namely, the progress of tea cultivation in the Himalayan provinces of Kumaon and Gurhwall, and in other localities in that direction, the Society has been put in possession of very satisfactory information through the kindness of the Government of the North-Western Provinces, and by various communications addressed to the Secretary by Dr. Jameson, the Director of these experiments.†

* Some interesting particulars on this subject will be found in the Journal, Vol. vi. page 8 of correspondence and selections.

† In his last communication, Dr. Jameson informs the Society, that he is about crossing the Sutledge at Rampore, and from thence he will proceed through Koollou and Mundee to Kote Kangra, "in order to ascertain if our newly acquired territory is fitted for tea cultivation." Dr. Jameson further states, that new plantations are to be established in Soubul, Barrowli, in the neighbourhood of Kusowli, and at Milpoor in Sirmoor, and other spots on the west of the Jumna ;—in all of which places there is much land adapted

long and interesting report, drawn up by this Officer, is now in the press, and will appear in an early number of the Society's Journal.

Nor has the importance of endeavouring to obtain a machine better adapted for an expeditious and economical separation of the wool from the seed of indigenous and foreign cotton, than what we at present possess,—(and for which purpose the Society, in conjunction with Major Jenkins, the Commissioner of Assam, has for the last five years, offered a prize of Rs. 500 and a gold medal,) been lost sight of. The Society has received several communications on the subject from Mr. Robert Burn, late of Bombay, but now a resident of Edinburgh, and from Mr. Petrie, the Engineer attached to the Government cotton farms at Coimbatore. The machine which the former gentleman intimates his intention of sending from Scotland is on the *churka* principle, that constructed by the latter is simply the American saw-gin, slightly modified to adapt it to cleaning the indigenous cotton. A third gentleman, Mr. Mather, has also turned his attention to the subject, and by an improvement on the *churka* of the late Mr. Owen Potter, has made a machine which has been so favorably thought of by a committee appointed by the Government of the North-Western Provinces to report on it, that he has been lately deputed to Calcutta to superintend the manufacture of a number of them at the mint. To Mr. Mather, who was introduced by Mr. Hamilton Bell of Agra, an old member and correspondent, (and to whom the Authorities have entrusted the management of certain cotton experiments now in progress in the vicinity of that station) the Society has endeavoured to render every assistance in carrying out the object he has in view.*

for the plant. He adds, that he has received instructions from the Government of the North-Western Provinces to spare no expense in order to extend the plantations, and that the Governor General has placed a lac of rupees per annum at his disposal for that purpose.

* Unfortunately, the machine which Mr. Mather considers as most likely to be of service to him in his enquiries, namely, that manufactured on the *churka* principle by Mr. Holsdsworth of Glasgow, is not at present available, having been placed a short time ago at the disposal of the Commissioner of Revenue at Dacca, for the use of the Government Cotton Farms in that district.

Another subject which, in its turn, has attracted attention, has reference to the *Kunchoora* fibre of Rungpore. The *Kunchoora* fibre of Rungpore, This superior material has been lately brought or *Rheea* of Assam. to the notice of the Society by Dr. Campbell of Darjeeling, and additional particulars given by Mr. Henley of Calcutta. As these details have been published in the Journal it is unnecessary to recapitulate them here. It is however worthy of remark, that further enquiries have tended considerably to strengthen an opinion that this plant, the *Urtica tenacissima* of Roxburgh,* is identical with that from which the superior fabric;

* Dr. Roxburgh states, he was informed by a friend, a resident of Canton, that the grass-cloth of China is made from the same plant that yields the fibre which Marsden, in his history of Sumatra, calls Calooee (*Urtica tenacissima*). At Penang, he states, it is called *Ramy*.—(See Roxburgh's observations on substitutes for hemp and flax.) Col. Low, in his work on Penang and Province Wellesley, alludes to the same plant, and by the same name (*Ramee*), as yielding a sort of hemp : and observes, that it might be easily manufactured into the linen which in China is called grass-cloth. "The Chinese here," he adds, "call the plant *Cho*, and allege that it is the same as that which grows in China, where it is used for making the cloth just mentioned." Col. Burney, when Resident at Ava, sent a quantity of fibre of *Urtica tenacissima* to the Society ; he states, that the Shans use it for every kind of cordage ; by them it is called *Pan*.—(Transactions, vol. 3, page 11.) The late Mr. Landers, a traveller in the same country, refers also to this hemp, and adds, that though the Shans have various other fibres they invariably prefer this description.—(Journal, vol. 2, page 253.) Major Jenkins has frequently sent specimens of it from Assam, and he also met with it in Cachar. That from the latter country he describes as "more like good hempen twine than that made from any plant in India, and from one small sample I saw well bleached, it would, I imagine, make a very neat canvas."—(Trans. vol. 2, page 171.) Major Macfarquhar raised it very readily at Tavoy, on the Tenasserim coast, from a few shoots sent to him in 1836 by Col. Burney from Ava. "It is cultivated," he remarks, "by the Shans, Siamese, and the Chinese ; the two latter, with whom I have spoken on the subject, are loud in its praise for its fineness of texture and durability, both as cloth and cordage."—(Trans. vol. 5, page 19.) Mr. Fortune makes no mention of the grass-cloth in his recently published work, "Three years' wanderings in China ;" he merely observes, that "there is a species of *Urtica*, both wild and cultivated, which grows about 3 or 4 feet high, and produces a strong fibre in the bark, which is prepared by the natives, and sold for the purpose of making ropes and cables." It is not, however, improbable that the

known as the "grass-cloth" of China, is manufactured, and for which there is, at present, a large demand for the English market. The probability of this identity rests principally on a communication from Major Hannay, who intimates that the *Rheea* (Kunchoora) of Upper Assam has been recognized by an intelligent Chinese gentleman, and corroborated by others of his countrymen, who were formerly employed at the Government tea manufactory, to be the *Bengchung Hapo*, or grass-cloth plant of China. Major Hannay has himself long been aware that the Shan hemp and the *Rheea* are the produce of the same plant. The question is alike interesting and important. Should the additional enquiries the Society is now instituting tend to remove all doubt of the identity of the Rungpore and Assam nettle with the China plant, the attention of those who are now engaged in the introduction into England of the material from which the grass-cloth is made, might be advantageously turned to the Indian product, in order to ascertain if it can be grown and prepared at a less cost. If it, however, prove to be a different plant, the information thus brought to public notice may induce those interested in such matters to ascertain whether this fibre cannot be turned to a more profitable account than for fishing nets and towing lines, the only purposes for which, it would appear, it is at present employed.

The Society cannot close this brief review of the various objects which have occupied its attention during the
 Conclusion. past twelve months without expressing an earnest hope, that the members generally will continue to contribute all such items of information as may be in their power, adding thereby to our knowledge of the agricultural capabilities of this vast empire, and assisting to the more mature development of the natural-useful products of the country. It further trusts, that du-

plant here referred to is *the* one, for it is well known that the plant which yields so fine a fibre as that from which grass-cloth is made, also affords a substance sufficiently strong for manufacturing into the largest cables. Moreover, this allusion to a fibre prepared from a species of the nettle tribe is interesting, inasmuch as it assists to strengthen the opinion—which has been doubted by more than one writer on the subject—that this grass-cloth fibre is produced from one of the *Urticeæ*.

ring the coming year, a considerable addition may be made to the list of subscribers to enable it to progress still more satisfactorily in its career of public utility. It is matter of congratulation that the Society has recently seen occasion to vote its thanks, to Dr. Huffnagle, one of its members, and to Lord Auckland, and Joseph Hume, Esq., M. P., for the interest shown in its favor by endeavouring to secure to the Society, the countenance and support of the distinguished nobleman appointed to the Government of this country, in succession to its present patron.

Report of the Finance Committee.

The Finance Committee have the pleasure of submitting the following report, explanatory of the pecuniary transactions of the Society, during the year 1847.

The total *Receipts* for the past year have been Co's. Rs. 19,430-10-8, including the temporary additional subscription on account of the Society's proportion of the debt for the Metcalfe Hall of Rs. 1,790, Rs. 1,034 for proceeds of sugar-cane delivered from the nursery garden, and Rs. 324 by sale of surplus stock of vegetable seeds, and copies of the Journal.

The total *Disbursements* for the same period amount to Rs. 19,222-13-5, which include Rs. 8,551-14 invested in Government Securities; Rs. 395 transferred to certain subscribers to the "Ryan Testimonial," being the aggregate of their rateable division of the balance of that fund; and Rs. 939 the cost of getting through the press an edition of Fenwick's vernacular Hand-book on Gardening.

The disbursements on account of the nursery garden, Rs. 2,423, though apparently heavy, are relieved by a credit of Rs. 1,034 for canes sold during the season.

The vested fund having received the addition above-mentioned, Rs. 3,551, makes that dependency Rs. 15,466, as shown in the Government Agent's account current annexed to this report.

The Cash balance in the Bank of Bengal is large, viz: Rs. 3,184; but it has been purposely retained to meet a remittance to Messrs.

Landreth of Philadelphia of Rs. 2,224 for seeds supplied during the year.

The list of subscriptions in arrear show an aggregate of Rs. 11,097, being Rs. 840 in excess of last year. Of the arrears of 1846, consisting of Rs. 10,297, the sum of Rs. 4,574 has been collected, a further sum of Rs. 1,057 has been written off as irrecoverable, (being principally on account of members whose names have been struck off the list) leaving a balance of arrears for that year of Rs. 4,666. The accumulation of arrears during 1847 is Rs. 6,431, making a total of subscriptions due to the Society, as above mentioned, of Rs. 11,097.

The liabilities in 1846 amounted to Rs. 2,157. Of this sum the greater part has been liquidated during the past year, leaving merely a balance of Rs. 620 to be retained as "prizes for an improvement in the Indian *Churka*." There is no new liability against the Society except that for seeds, as above noted, and this the cash balance can more than sufficiently meet.

The Committee beg to report to the Society that, although there has been a continued improvement in the amount of their vested fund, they have been much disappointed in the hope they expressed last year of a reduction in the arrears due by some members, and would now take leave to suggest, whether some more stringent course should not be adopted against the defaulters. Perhaps the Society would not object to withhold all supplies of seeds, plants, and copies of the Journal, from all members whose subscriptions were 4 or 5 quarters in arrears; thus, by subjecting them to a practical inconvenience, endeavour to remind them of their monetary obligations to the Society.

M. S. STAUNTON,

J. W. LAIDLAY,

Members of the Finance Committee.

Statement of Receipts and Disbursements of the Agricultural and Horticultural Society of India, from 1st January to the 31st December, 1847.

RECEIPTS.

From Members, subscriptions collected during the year for the ordinary purposes of the Society,	12,048	10	6	
Ditto, additional temporary subscriptions to assist in meeting the Society's proportions of the debt on the Metcalfe Hall,	1,790	0	0	
				13,838 10 6
„ Government annual donation,	1,045	0	0	
„ Ditto monthly allowance for 12 months, at 135-13-6 per month,	1,630	2	0	
				2,675 2 0
„ Sir Lawrence Peel's donation to the Society to encourage the culture of flowers,				300 0 0
„ Accruings of interest on fixed assets,				632 0 ½
„ Proceeds of sugar-cane delivered from the Nursery Garden in 1846 and 1847,	1,034	2	0	
„ Ditto of mango grafts, ditto from ditto,	25	0	0	
„ Ditto of a portion of surplus Cape vegetable and American vegetable and flower seeds sold in 1846 and 1847,	271	0	0	
„ Ditto of copies of the Transactions of the Society,	9	0	0	
„ Ditto of copies of the Journal of the Society,	44	14	0	
„ Ditto of copies of Fenwick's Hand-book of Gardening,	492	0	0	
„ Ditto by advertisement inserted in Journal,	33	5	3	
„ Ditto of old seed boxes, splinter and glazed cases,	42	14	6	
„ Dr. Mouat, his rateable division of balance of Ryan Testimonial Fund, re-transferred to the Society,	7	8	0	
„ Members, being the amount of freight on boxes of seeds paid by the Society in 1846,	4	8	0	
„ Government, being the amount of 20 maunds of "Ballam's" seed paddy supplied by the Society for transmission to Arracan, including cooley hire,	20	10	3	
				1,984 14 0
Total Receipts, Co's Rs.				19,430 10 8
Balance in the Bank of Bengal on 31st December, 1846,	3,986	12	10	
Ditto in the hands of Government Agent on ditto,	34	7	1	
				3,921 3 11
Grand Total, Co's Rs.				22,551 14 7

DISBURSEMENTS.

FOREIGN VEGETABLE AND FLOWER SEEDS.

By C. N. Villet, for Cape garden seeds,	1,500	0	0	
„ Mr. Carter, for English flower seeds,	741	10	9	
„ Mr. Halliday, for a small assortment of English vegetable and flower seeds,	7	0	0	
				2,248 10 9

LIBRARY.

By Books purchased during the year for the Library, ...	166	0	0	
„ Binding books during the year,	14	4	0	
				180 4 0

PRINTING.

„ Sundry parties, for printing Regulations of the Society, headings to Letters, &c.				43 0 0
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JOURNAL.

„ Bishop's College Press, for printing parts 3 and 4 of Volume 5, and part 1 of Volume 6,	1,146	8	0	
„ Lithographing plates for Journal,	40	0	0	
„ Thacker and Co., for paper for plates for ditto,	9	8	0	
				1,196 0 0

NURSERY GARDEN.

„ Ordinary expences incurred on account of the Nursery Garden from 1st December 1846 to 30th November 1847, ...	2,294	0	9	
„ Additional expence for laying down pukka walks in flower garden, putting up venetians to the verandah of Overseer's new house, a supply of garden implements, and a few plants,	72	0	0	
„ Ditto in full of account for erection of house, conservatory, &c.	57	14	3	
				2,423 15 0

ESTABLISHMENT.

„ Amount for Establishment from 1st December 1846 to 30th November, 1847,				4,512 6 0
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FENWICK'S HAND-BOOK OF GARDENING.

„ Star Lithographic Press, for lithographing plates for Fenwick's Hand-book of Gardening,	457	8	0	
„ Bishop's College Press, for printing 500 copies of ditto ditto,	480	8	0	
„ Printing receipts for ditto ditto,	1	14	0	
				939 14 0
„ Mr. Fenwick, proceeds of 240 copies of his Hand-book,				480 0 0

MEDALS.

„ Hamilton and Co., for gold and silver medals,				240 0 0
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PECUNIARY REWARDS.

„ Prizes to mallees, for vegetables and fruits at the exhibitions held on the 2nd February, 21st May, and 2nd December,	344	8	0	
„ Ditto, to ditto, for flowers at the exhibitions held on the 24th February, 16th April, 28th October, and 21st December,	369	0	0	
„ The Hooghly Branch Society, annual donation,	50	0	0	
„ The Cuttack Branch, ditto ditto,	50	0	0	

SOCIETY'S VESTED FUND.

„ The Government Agent, for the purchase of a 4-5 per cent. Government Promissory Note for Sicca Rs. 3,000 to be added to the vested Fund, inclusive of interest,	3,030	3	0	
„ Ditto, for a 3-5 per cent. ditto ditto, for Sicca Rs. 500, inclusive of interest,	521	11	0	
				3,551 14 0

Statement.

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FURNITURE FOR METCALFE HALL.

By Sundry parties, for Furniture, 85 6 0

LOAN—METCALFE HALL.

„ Rajah Shuttchurn Ghosaul, in full of 1,000 Rs. advanced to the Society in October 1845, to assist in liquidating debt on Metcalfe Hall, 250 0 0
 „ Baboo Ramgopaul Ghose, ditto ditto, 250 0 0
 500 0 0

METCALFE HALL—PUBLIC LIBRARY.

„ Curators Public Library, Society's contribution towards the re-roofing of the Upper Hall of the Metcalfe Hall, ... 200 0 0

ADVERTISEMENTS.

„ Advertising in the public prints, notices of general meetings, of shows of flowers and vegetables, distribution of seeds, sugar-cane, &c. &c. &c. 382 0 0

STATIONERY.

„ Stationery for office books, and for the use of the office, ... 35 6 6
 „ Ditto 10 reams of brown packing paper for packing seeds, ... 110 0 0
 148 6 6

FREIGHT.

„ Freight on boxes of seeds, books, &c. sent and received from Cape, England, America, &c. 243 15 11

RYAN TESTIMONIAL.

„ Dr. Mouat, the proportion of balance of the Ryan Testimonial Fund of certain members who have transferred their rateable amounts for the Ryan Scholarship Fund, 333 8 6
 „ Certain Subscribers to the above Fund, their rateable division as requested, 62 2 0
 395 10 6

POSTAGE AND SUNDRY CHARGES.

„ Postage on the Journals, on letters sent and received, and for petty expences, 435 0 0
 „ Eggs of silk-worms procured on account of Government, ... 14 0 0
 „ Amount advanced by Villet and Son, for insuring Cape garden seeds, 38 0 0
 „ Twenty maunds of “Ballam” seed paddy, procured on account of Government, 20 0 0
 „ Holmes and Co., for a Chunar stone step for a pedestal for Lord Metcalfe's Bust, 50 0 0
 „ Extra packermen and Writers, for subdividing and writing on seeds, 22 14 0
 „ Presents to Constables and Burkundauzes for attending at Horticultural and Floricultural exhibitions during the year, 58 0 0
 637 14 0

Total Disbursements Co's. Rs. ... 19,222 13 5

„ Balance in the Bank of Bengal on 31st December, 1847, ... 3,184 4 11
 „ Ditto in the hands of Government Agent on ditto, ... 144 12 3
 3,329 1 2

Grant Total, Co's. Rs. ... 22,551 14 7

Memorandum.

DISBURSEMENTS.

To amount of Disbursements during the year 1847, as per Statement, ...	19,922 13 5
.. Balance in the Bank of Bengal on 31st December 1847, ...	3,184 4 11
.. Ditto in the hands of Government Agent on ditto, ...	144 12 3
	<hr/> 3,329 1 2
Total Co's. Rs. ...	<hr/> 22,551 14 7

LIABILITIES.

Amount for prizes for improvement on Indian Charaka, ...	620 0 0
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RECEIPTS.

By amount of Receipts during the year 1847, as per Statement, ...	19,430 10 8
.. Balance in the Bank of Bengal on 31st December 1846, ...	3,086 12 10
.. Ditto in the hands of Government Agent on ditto, ...	34 7 1
	<hr/> 3,151 3 11
Total Co's. Rs. ...	<hr/> 22,551 14 7

DEPENDENCIES.

Amount invested in Government Securities lodged in the Government Agency Office, ...	15,466 0 0
Amount of Subscription in arrear, ...	11,097 9 9
Amount proceeds for sugar-cane not yet realized, about ...	473 0 0

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of September, 1847.

Days of the Month.	Moon's Phases.	Observed at 9 h. 50 m.					Observed at 4 p. m.					Observations made at Sunset.					Rain Gauges.	
		Barometer reduced to 32° Fahrenheit.	Temperature.		Wind.	Direction from Sunrise to Noon.	Barometer reduced to 32° Fahrenheit.	Temperature.		Wind.	Direction from 2 h. 40 m. to 4 p. m.	Barometer reduced to 32° Fahrenheit.	Temperature.		Wind.	Direction from 4 p. m. to Sunset.	Elevation.	Feet.
			Of the Mer.	Of the Air.				Of the Mer.	Of the Air.				Of the Mer.	Of the Air.				
		Inches	°	°	°	°	Inches	°	°	°	°	Inches	°	°	°	°	Upper.	Lower.
1	☾	29.679	90.0	86.8	81.9	80.0	29.691	84.5	84.8	81.0	80.3	29.695	84.5	84.0	80.3	80.4	40	4
2	☾	29.674	87.8	85.2	80.6	81.8	29.712	82.2	84.9	80.3	80.3	29.707	82.5	84.0	80.3	0.98	0.54	
3	☾	29.683	87.4	86.5	82.5	83.5	29.715	82.2	85.0	81.5	81.5	29.727	82.7	84.6	79.5	0.99	0.50	
4	☾	29.683	87.8	86.2	82.9	82.9	29.729	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.13	0.37	
5	☾	29.690	88.0	86.2	82.9	82.9	29.732	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.12	0.37	
6	☾	29.690	88.0	86.2	82.9	82.9	29.732	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.12	0.37	
7	☾	29.693	88.0	86.2	82.9	82.9	29.732	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.12	0.37	
8	☾	29.693	88.0	86.2	82.9	82.9	29.732	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.12	0.37	
9	☾	29.693	88.0	86.2	82.9	82.9	29.732	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.12	0.37	
10	☾	29.693	88.0	86.2	82.9	82.9	29.732	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.12	0.37	
11	☾	29.693	88.0	86.2	82.9	82.9	29.732	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.12	0.37	
12	☾	29.693	88.0	86.2	82.9	82.9	29.732	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.12	0.37	
13	☾	29.693	88.0	86.2	82.9	82.9	29.732	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.12	0.37	
14	☾	29.693	88.0	86.2	82.9	82.9	29.732	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.12	0.37	
15	☾	29.693	88.0	86.2	82.9	82.9	29.732	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.12	0.37	
16	☾	29.693	88.0	86.2	82.9	82.9	29.732	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.12	0.37	
17	☾	29.693	88.0	86.2	82.9	82.9	29.732	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.12	0.37	
18	☾	29.693	88.0	86.2	82.9	82.9	29.732	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.12	0.37	
19	☾	29.693	88.0	86.2	82.9	82.9	29.732	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.12	0.37	
20	☾	29.693	88.0	86.2	82.9	82.9	29.732	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.12	0.37	
21	☾	29.693	88.0	86.2	82.9	82.9	29.732	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.12	0.37	
22	☾	29.693	88.0	86.2	82.9	82.9	29.732	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.12	0.37	
23	☾	29.693	88.0	86.2	82.9	82.9	29.732	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.12	0.37	
24	☾	29.693	88.0	86.2	82.9	82.9	29.732	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.12	0.37	
25	☾	29.693	88.0	86.2	82.9	82.9	29.732	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.12	0.37	
26	☾	29.693	88.0	86.2	82.9	82.9	29.732	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.12	0.37	
27	☾	29.693	88.0	86.2	82.9	82.9	29.732	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.12	0.37	
28	☾	29.693	88.0	86.2	82.9	82.9	29.732	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.12	0.37	
29	☾	29.693	88.0	86.2	82.9	82.9	29.732	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.12	0.37	
30	☾	29.693	88.0	86.2	82.9	82.9	29.732	82.5	85.4	82.0	82.0	29.744	82.7	84.0	81.5	0.12	0.37	
Mean.		29.704	87.5	86.3	81.1	81.8	29.676	89.2	86.6	85.7	80.0	29.613	84.3	84.0	79.1	9.71	10.95	

These Observations have been made for the most part with a supply of new and first-rate Instruments, received into the Observatory, by orders of the Bengal Government, a brief description of the Instruments seems necessary.

Barometer by Troughton, used prior to the 1st June 1844. Observations reduced to 32° Fahr. = 29.693

by Col. Everest, used from 1st June to 31st August 1844. ... Ditto ... = 29.697

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of October, 1847.

Days of the Month	Observed at 9 a. 50 m.					Observed at 4 p. m.					Observations made at Sunset.					Rain Gauge.	
	Temperature.					Temperature.					Temperature.					Elevation.	
	Of the Mer.	Of the Air.	Of Wet Bulb.	Direction	Barometer reduced to 32° Fahrenheit.	Of the Mer.	Of the Air.	Of Wet Bulb.	Direction	Barometer reduced to 32° Fahrenheit.	Of the Mer.	Of the Air.	Of Wet Bulb.	Direction	Of the Mer.	Feet.	Inches
1	77.0	77.0	75.0	E	29.717	77.0	75.0	73.6	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
2	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
3	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
4	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
5	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
6	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
7	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
8	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
9	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
10	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
11	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
12	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
13	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
14	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
15	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
16	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
17	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
18	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
19	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
20	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
21	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
22	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
23	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
24	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
25	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
26	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
27	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
28	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
29	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
30	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
31	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66
Mean.	76.5	77.0	76.0	E	29.717	77.0	76.0	75.0	E	29.618	77.2	77.0	76.0	E	77.2	40	1.66

* From 16th to 20th inclusive.

These Observations have been made for the most part with a supply of new and first-rate Instruments, received into the Observatory, by orders of the Bengal Government, a brief description of the Instruments seems necessary.

Barometer by Troughton, used prior to the 1st June 1844. Observations reduced to 32° Fahr.
 by Col. Everest, used from 1st June to 31st August 1844.
 Standard Barometer by Newman, used from 1st Sept. 1844.
 Ditto
 Ditto
 29.654
 29.667

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of November, 1847.

an.	Moon's Phase	Observed at 9 a.m. 50 m.					Observed at 4 p.m.					Observations made at Sunset.					Rain Gauges.	
		Temperature.		Wind.	Temperature.		Temperature.		Wind.	Temperature.		Barometer reduced to 32° Fahrenheit.	Temperature.		Wind.	Direction from 4 p.m.	Elevation.	
		Of the Mer.	Of the Air.		Of the Mer.	Of the Air.	Of the Mer.	Of the Air.		Of the Mer.	Of the Air.		Of the Mer.	Of the Air.			Upper.	Lower.
		Inches.	°	°	Inches.	°	°	°	°	Inches.	°	°	°	°	°	°	Feet.	Feet.
1	☾	30,010	83.0	83.0	29,954	85.0	85.5	85.0	N.W.	29,939	86.0	86.0	86.0	86.0	86.0	86.0	40	...
2	☾	30,021	82.5	83.0	29,954	86.0	85.5	85.0	N.W.	29,939	86.0	86.0	86.0	86.0	86.0	86.0	40	...
3	☾	30,011	82.5	83.0	29,954	86.0	85.5	85.0	N.W.	29,939	86.0	86.0	86.0	86.0	86.0	86.0	40	...
4	☾	30,022	80.5	81.0	29,973	84.0	84.0	84.0	N.W.	29,917	85.0	85.0	85.0	85.0	85.0	85.0	40	...
5	☾	30,048	77.2	77.0	29,995	81.0	81.0	81.0	N.W.	29,931	83.5	83.5	83.5	83.5	83.5	83.5	40	...
6	☾	30,069	79.0	77.8	29,998	82.8	83.0	83.0	N.W.	29,946	83.5	83.5	83.5	83.5	83.5	83.5	40	...
7	☾	30,040	79.1	79.8	29,998	83.1	83.4	83.4	N.W.	29,946	83.5	83.5	83.5	83.5	83.5	83.5	40	...
8	☾	30,041	78.7	79.0	29,998	79.3	79.0	79.0	N.W.	29,946	83.5	83.5	83.5	83.5	83.5	83.5	40	...
9	☾	30,056	76.2	77.0	29,998	80.0	80.0	80.0	N.W.	29,946	83.5	83.5	83.5	83.5	83.5	83.5	40	...
10	☾	30,012	76.0	75.0	29,972	79.0	78.5	78.5	N.W.	29,920	80.4	80.4	80.4	80.4	80.4	80.4	40	...
11	☾	30,032	76.0	75.0	29,992	79.0	78.5	78.5	N.W.	29,920	80.4	80.4	80.4	80.4	80.4	80.4	40	...
12	☾	30,041	74.5	74.1	29,991	78.5	78.0	78.0	N.W.	29,920	80.4	80.4	80.4	80.4	80.4	80.4	40	...
13	☾	30,032	75.0	75.0	29,991	78.5	78.0	78.0	N.W.	29,920	80.4	80.4	80.4	80.4	80.4	80.4	40	...
14	☾	30,011	75.5	75.2	29,991	78.5	78.0	78.0	N.W.	29,920	80.4	80.4	80.4	80.4	80.4	80.4	40	...
15	☾	30,072	76.0	76.0	29,991	78.5	78.0	78.0	N.W.	29,920	80.4	80.4	80.4	80.4	80.4	80.4	40	...
16	☾	30,082	76.0	76.0	29,991	78.5	78.0	78.0	N.W.	29,920	80.4	80.4	80.4	80.4	80.4	80.4	40	...
17	☾	30,082	76.0	76.0	29,991	78.5	78.0	78.0	N.W.	29,920	80.4	80.4	80.4	80.4	80.4	80.4	40	...
18	☾	30,082	76.0	76.0	29,991	78.5	78.0	78.0	N.W.	29,920	80.4	80.4	80.4	80.4	80.4	80.4	40	...
19	☾	30,074	77.8	77.8	29,991	78.5	78.0	78.0	N.W.	29,920	80.4	80.4	80.4	80.4	80.4	80.4	40	...
20	☾	30,037	78.0	78.0	29,991	78.5	78.0	78.0	N.W.	29,920	80.4	80.4	80.4	80.4	80.4	80.4	40	...
21	☾	30,039	79.8	79.8	29,991	78.5	78.0	78.0	N.W.	29,920	80.4	80.4	80.4	80.4	80.4	80.4	40	...
22	☾	30,039	79.8	79.8	29,991	78.5	78.0	78.0	N.W.	29,920	80.4	80.4	80.4	80.4	80.4	80.4	40	...
23	☾	30,044	78.8	78.8	29,991	78.5	78.0	78.0	N.W.	29,920	80.4	80.4	80.4	80.4	80.4	80.4	40	...
24	☾	30,044	78.8	78.8	29,991	78.5	78.0	78.0	N.W.	29,920	80.4	80.4	80.4	80.4	80.4	80.4	40	...
25	☾	30,045	76.6	76.2	30,003	79.3	79.0	79.0	N.W.	30,018	79.3	79.3	79.3	79.3	79.3	79.3	40	...
26	☾	30,050	74.9	74.6	30,003	79.3	79.0	79.0	N.W.	30,018	79.3	79.3	79.3	79.3	79.3	79.3	40	...
27	☾	30,008	74.9	74.6	30,003	79.3	79.0	79.0	N.W.	30,018	79.3	79.3	79.3	79.3	79.3	79.3	40	...
28	☾	30,008	74.9	74.6	30,003	79.3	79.0	79.0	N.W.	30,018	79.3	79.3	79.3	79.3	79.3	79.3	40	...
29	☾	30,005	75.3	75.7	29,955	79.7	79.9	79.9	N.W.	29,955	80.3	80.3	80.3	80.3	80.3	80.3	40	...
30	☾	30,024	75.3	75.7	29,955	79.7	79.9	79.9	N.W.	29,955	80.3	80.3	80.3	80.3	80.3	80.3	40	...
31	☾	30,055	78.0	78.7	30,015	79.8	79.8	79.8	N.W.	30,015	80.5	80.5	80.5	80.5	80.5	80.5	40	...
an.		30,008	77.6	77.5	29,962	81.0	80.4	80.4	70.1	29,962	81.5	80.1	80.1	80.1	80.1	80.1	5.40	5.59

These Observations have been made for the most part with a supply of new and first-class Instruments, received into the Observatory, by orders of the Bengal Government, a brief description of the Instruments seems necessary.

Barometer by Thompson, used prior to the 1st June 1844. Observations reduced to 32° Rah.
 No. 52, Standard Barometer by Newman, used from 1st June to 31st August 1844.
 No. 86, Ditto
 No. 87, Ditto
 No. 88, Ditto
 No. 89, Ditto
 No. 90, Ditto
 No. 91, Ditto
 No. 92, Ditto
 No. 93, Ditto
 No. 94, Ditto
 No. 95, Ditto
 No. 96, Ditto
 No. 97, Ditto
 No. 98, Ditto
 No. 99, Ditto
 No. 100, Ditto

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 Hunter, M. Esq. Indigo planter, Jessore.
 Hurreymarsh Dey, Baboo, Merchant, Calcutta.
 Hurry Mohun Sen, Baboo, Dewan of the Bank of Bengal, Calcutta.
 Huthwaite, Lieut.-Colonel Edward. C.B. (Horse Artillery,) Loodianah.
 Impey, Lieutenant E. J. Assistant to Commissioner of Tenasserim Provinces, Tavoy.
 Inglis, Henry, Esq. Sylhet.
 Issurchunder Ghosaul, Baboo, Deputy Magistrate, Hooghly.
 Jackson, Welby Brown, Esq. Civil service, Calcutta.
 Jackson, C. C. Esq. Civil service, Agra.
 Jackson,† Alexander R. Esq. M.D.
 James, Lieut. Hugh, Deputy Collector, Larkana, Upper Scinde.
 James, Lieutenant H. C. (32nd Regiment N. I.) Lahore.
 Jenkins, Major Francis, Commissioner of Assam, and Governor General's Agent on the N. E. Frontier.
 Jennings, C. R. Esq. Indigo planter, Surdah.
 Johnson, P. Esq. Merchant, Calcutta.
 Johnson,† George William, Esq. Barrister.
 Johnstone, Capt. J. Commandant 1st Regt. Nizam's Infantry, Aurungabad.
 Jourdain,† The Honorable Mr.
 Judge, Spencer, Esq. Attorney, Supreme Court, Calcutta.

- Kaye,† J. William, Esq.
 Kearnes, Duppa Hamilton, Esq. Indigo planter, Hazrapore Factory, viâ Jenida.
 Kelsall, T. S. Esq. Merchant, Calcutta.
 Kettlewell, W. W. Esq. Merchant, Calcutta.
 Kinleside, Capt. R. R. Artillery, Umballah.
 Kirke, Captain H. (12th Regiment N. I.) Supt. of the Dhoon Canal, Deyrah.
 Kirkpatrick, W. Esq. Deputy Register, Sudder Dewanny Adawlut, Calcutta.
 Kissub Chunder Roy, Baboo, Landholder, Nuddeah.
 Laidlay, J. W. Esq. Merchant, Calcutta.
 Lake,† W. H. Esq. Merchant.
 Lake, R. B. Esq. Merchant, Calcutta.
 Lall Beharee Dutt, Baboo, Merchant, Calcutta.
 Lamb, George, Esq. Medical service, Calcutta.
 Lamb, Capt. Wm. (51st N. I.) Lucknow.
 Lang, A. Esq. Civil service, Allahabad.
 Larpent, Albert DeHochepped, Esq. Merchant, Calcutta.
 Laruletta,* A. Esq. Indigo planter, Jeygunge.
 Latter, Captain Thomas, (67th Regiment N. I.) Moulmein.
 Lattey,† R. J. Esq. Merchant.
 Lautour, E. F. Esq. Civil service, Gya.
 Lawrence, Lieut.-Colonel H. M., C.B. (Artillery.)
 Lawson, W. J. Esq. Indigo planter, Chunar.
 Leach,*† Thomas, Esq. Merchant.
 Leishman,† R. Esq. Merchant, Calcutta.
 Leith,† J. F. Esq. Barrister.
 Lewis, W. T. Esq. Assistant Resident, Penang.
 Liebig,† Dr. Justus, Germany, (Honorary Member.)
 Lindsay,† Alexander Kyd, Esq. Medical service.
 Llewelyn, J. G. Esq. Calcutta.
 Lloyd, Colonel G. W. A., C.B. (28th Regiment N. I.) Lucknow.
 Loch, T. C. Esq. Civil service, Beerbhoom.
 Logan,† W. R. Esq. Indigo planter.
 Loughnan, Robert James, Esq. Civil service, Backergunge.
 Lovell, George, Esq. Merchant, Penang.
 Lowis, John, Esq. Civil service, Calcutta.
 Lowth, Frederick, Esq. Civil service, Balasore.
 Lowther,* Robert, Esq. Civil service, Allahabad.
 Ludwig,† Baron, Cape of Good Hope, (Honorary Member.)
 Luke, William, Esq. Civil service, East Burdwan.
 Lushington,† Frederick A. Esq. Civil service.
 Lyall,† Charles, Esq. Merchant.
 Lyall,† Robert, Esq. Merchant.

- McArthur, Peter, Esq. Indigo planter, Malda.
 McCullum, D. Esq. Merchant, Calcutta.
 McDonell, E. Esq. Sub-Deputy Opium Agent, Chumparun, Tirhoot.
 McDowall, William, Esq. Indigo planter, Rungpore.
 MacFarlan,† David, Esq. Civil service.
 Macfarquhar, Major H. Tavoy.
 Mackenzie, James J. Esq. Merchant, Calcutta.
 Mackilligin, J. P. Esq. Merchant, Calcutta.
 Mackintosh, George G. Esq. Civil service, Burdwan.
 Mackay,† J. Esq. (Honorary Member.)
 Mackey, D. C. Esq. Merchant, Calcutta.
 MacLagan,* Frederick, Esq. Indigo planter, Kishnagur.
 McLeod,† Colonel Duncan, (Engineers.)
 McLeod, Donald Friel, Esq. Civil service.
 McLeod, Major William, (30th Regiment Madras N. I.)
 McLeod, Donald, Esq. Tirhoot.
 Macnair,† Robert, Esq. Indigo planter.
 Macpherson,*† George G. Esq. Merchant, Calcutta.
 Mactier, T. B. Esq. Civil service, Cuttack.
 Maddock, The Honorable Sir T. H. Deputy Governor of Bengal,
 Calcutta.
 Maharaj* Dheraj Matabchund, Bahadoor, Rajah of Burdwan.
 Malet, O. W. Esq. Civil service, Midnapore.
 Manickjee,* Rustumjee, Esq. Merchant, Calcutta.
 Mansell,† Charles Grenville, Esq. Civil service.
 Marcus,* J. P. Esq. Calcutta.
 Marquis, J. Esq. Indigo planter, Pubna.
 Marshman, J. C. Esq. Editor of the Friend of India, Serampore.
 Massey, George, Esq. Merchant, Calcutta.
 Masters,* J. W. Esq. Assistant to Commissioner of Assam, Now-
 gong.
 Mathie,* Major James, (European Regiment,) Deputy Commis-
 sioner of Assam.
 May,† John Stuart, Esq.
 Melville,† The Honorable W. H. L.
 Mercer, G. G. Esq. Indigo planter, Eta.
 Metcalfe, H. C. Esq. Civil service.
 Millman,† G. C. Esq. Merchant, London.
 Mills,*† Andrew John Moffat, Esq. Civil service.
 Molloy, R. Esq. Attorney, Calcutta.
 Monckton, H. Esq. Civil service, Calcutta.
 Money,* William James Henry, Esq. Civil service, Chittagong.
 Money, Wigram, Esq. Civil service, Mirzapore.
 Money, David Inglis, Esq. Civil service, Kishnagur.
 Moore,† Major J. A.
 Moore,† Henry, Esq.
 Moran, William, Esq. Indigo planter, Tirhoot.
 Mornay, H. Esq. Deputy Secretary Assam Company, Calcutta.

Morton, T. C. Esq. Barrister, Supreme Court, Calcutta.
 Mouat, Frederick J. Esq. M.D., Secretary to the Council of Education, and Professor of Chemistry, &c. Medical College, Calcutta.
 Munro,† Captain William, F.L.S. and F.B.E.S. (H. M. 39th Regiment.)
 Murray, Charles, Esq. Indigo-planter, Serajgunge Factory, Pubna.
 Muspratt, J. R. Esq. Civil service, Bauleah.
 Mutteelall Scal,* Baboo, Merchant, Calcutta.
 Mylius,† Captain George, (26th Cameronians.)

Napleton, Major T. E. A. (60th Regiment N. I.) Commandant of Hill Rangers, Bhauglepore
 Neave, Robert, Esq.* Civil service, Azimghur.
 Neelmoney Bysack, Baboo, Uncovenanted Assistant Commissioner, 19th Division, Bauleah.
 Newcomen,† C. E. Esq. Merchant.
 Nicol, Frederick, Esq. Sugar planter, Dhobah.
 Nisbet,† Captain E. P. Commander of the Agincourt, (Free Member.)
 Nobinchunder Bhose, Baboo, Merchant, Calcutta.
 Nursingchunder Bhose, Baboo, Merchant, Calcutta.

Oakes, Lieut. G. N. (46th N. I.) Junior Assistant G. G's. A., S. W. Frontier, Burkaghur.
 O'Brien, Captain Wm. (8th Regt. Nizam's Infantry,) Aurungabad.
 Ogilvy, J. B. Esq. Civil service, Chittagong.
 Ommaney, M. C. Esq. Civil service, Benares.
 O'Riley, Edward, Esq. Agriculturist, Amherst.
 Ouseley, Lieut.-Colonel J. R., G. G's. A., S. W. Frontier, and Commissioner of Chota Nagpore.
 Ouseley, Captain R. (50th Regiment N. I.) Principal Assistant G. G's. A., S. W. Frontier, Burkaghur.
 Owen, Lt. and Adj. (11th Regiment Madras N. I.) Moulmein.
 Owen, J. C. Esq. Pilot service, Calcutta.

Palmer, Lieut.-Colonel Thomas, (72nd Regiment N. I.) Delhi.
 Palmer, R. S. Esq. Merchant, Calcutta.
 Palmer,† John Carrington, Esq. Merchant.
 Palmer,* Thomas, Esq. Merchant, Calcutta.
 Parish, Lieut. W. H. Bengal Artillery, Loodianah.
 Parker,† Alfred, Esq. Merchant.
 Parker,† Henry Meredith, Esq.
 Parsons, Lieut.-Colonel James, C.B. (66th Regiment N. I.) Commandant Gwalior Contingent, Gwalior.
 Paton,† Francis Balfour, Esq. Merchant, Calcutta.
 Patrick, William, Esq. Merchant, Calcutta.
 Payter,* J. W. Esq. Indigo planter, Bogorah.
 Pearychund Mittra, Librarian, Public Library, Calcutta.

- Peel, The Honorable Sir Lawrence, Chief Justice, Supreme Court, Calcutta, (Vice-President.)
- Playre, Captain A. P. Principal Assistant to the Commissioner of Tenasserim Provinces, Moulmein.
- Pottit Parbun Sen, Merchant, Calcutta.
- Prannauth Bhowe, Baboo, Head Accountant, Bank of Bengal.
- Price, J. O. Esq. Government Cotton planter, Dacca.
- Prinsep, Charles Robert, Esq. LL.D., Standing Counsel, Supreme Court, Calcutta.
- Proby, F. Esq. Merchant, Dacca.
- Prosonoo Coomar Tagore, Baboo, Calcutta.
- Protap Chunder Sing, Rajah, Zemindar, Pakpara.
- Radhakant Deb, Bahadoor, Rajah, Calcutta.
- Radhamadhub Banoojee, Baboo, Merchant, Calcutta.
- Radhanauth Sikdar, Baboo, Revenue Survey, Dinapore.
- Raikes, Henry Thomas, Esq. Civil service, Midnapore.
- Rainey, W. H. S. Esq. Indigo planter, Kholua, Jessore.
- Rajkissen* Mookerjee, Baboo, Landholder, Hooghly.
- Rajbullub Seal, Baboo, Merchant, Calcutta.
- Ramchand Sing, Rajah, Berhampore.
- Ramgopaul Ghose, Baboo, Merchant, Calcutta, (Vice-President.)
- Ramdhone Ghose, Baboo, Calcutta.
- Ramanauth Tagore, Baboo, Dewan of the Union Bank, Calcutta.
- Rattray, Robert Haldane, Esq. Civil service, Calcutta.
- Ravenshaw, E. C. Esq. Civil service.
- Rayson, P. Esq. Indigo planter, Cossipore Factory, via Patoolee.
- Reddie, R. M. Esq. Merchant, Calcutta.
- Reddie, Capt. G. B. (20th Regt. N. I.) Dep. Asst. Comd'g. Genl., Mhow.
- Rehling, H. Esq. Indigo planter, Rungpore.
- Reid, J. Esq. Civil service, Beerbloom.
- Remfry,† George, Esq. Merchant.
- Rennie, John, Esq. Merchant, Calcutta.
- Reynolds, Lieutenant C. S. (49th Regiment N. I.) Junior Assistant Commissioner of Assam, Luckimpore.
- Rich,† Colonel R. (6th Regiment N. I.)
- Richards,*† J. Esq. Merchant.
- Richards, C. J. Esq. Merchant, Calcutta.
- Ridsdale, William Croft, Esq. Supt. Military Orphan Press, Calcutta.
- Rigby, Lieutenant H. Engineers, Cuttack.
- Robinson,* Francis Horsley, Esq. Civil service, Agra.
- Robinson, S. H. Esq. Dhoba.
- Robinson, G. B. Esq. Merchant, Calcutta.
- Robison, Major Hugh, Brigade Major and Paymaster, Nizam's Army, Ellichpore Division.
- Rogers, Captain T. E., I. N., Superintendent of Marine, Calcutta.

- Taylor, George, Esq. Barrister at Law, Calcutta.
 Teil, John, Esq. Tanner, Kidderpore.
 Terry, W. Esq. Indigo planter, Midnapore.
 Thomason, The Honorable James, Lieutenant Governor of the
 N. W. Provinces, Agra.
 Thomson, R. Scott, Esq. Surgeon, Calcutta.
 Thompson, J. V. Esq. M.D., F.L.S., Deputy Inspector General of
 Hospitals, Sydney, (Corresponding Member.)
 Thornton, John, Esq. Civil service, Agra.
 Thurburn, R. V. Esq. Indigo planter.
 Tickell, Captain S. R. (31st Regiment N. I.) Assistant to Com-
 missioner of Arracan.
 Tiemroth,† C. Esq.
 Tiery, L. Esq. Berhampore.
 Todd,† James, Esq.
 Tonnochy, Thomas, Esq. Deputy Collector, Bolundshohur.
 Torrens, Henry, Esq. Civil service, Berhampore.
 Torrens, Robert, Esq. Civil service, Calcutta.
 Tranter, Geo. Esq. Medical service, Meheedpore.
 Trevor, Edward Tayler, Esq. Civil service, Kishnaghur.
 Trotter,† John, Esq. Civil service.
 Trotter, T. C. Esq. Civil service, Tirhoot.
 Tucker, Charles, Esq. Civil service, Calcutta.
 Tucker, Henry Carre, Esq. Civil service, Goruckpore.
 Tulloh, C. R. Esq. Civil service, Jaunpore.
 Turner,* Thomas Jacob, Esq. Civil service.
 Turner, George, Esq. Medical service, Mirzapore.
 Turner, Alfred, Esq. Merchant, Calcutta.
 Turton, Sir Thomas E. M. Bart. Ecclesiastical Registrar, Supreme
 Court, Calcutta.
 Tweedie,† John Esq. Indigo planter.
 Twemlow, Major George, Nizam's Army, Aurungabad.
 Tynan, John, Esq. Superintendent of Salt Chokies, Jessore.
 Vansittart, H. Esq. Civil service, Lahore.
 Vaux, G. B. Esq. Calcutta.
 Vetch, Capt. Hamilton, Asst. to Commissioner of Assam, De-
 broghur.
 Vincent, W. Esq. Indigo planter, Cawnpore.
 Vizianagram, Meerza Rajah Vizearam Guzputty Rauze Bahadoor,
 Rajah of.
 Vos, J. M. Esq. Architect, Calcutta.
 Waghorn,† Thomas, Esq. (Honorary Member.)
 Wallace, A. Esq. Merchant, Calcutta.
 Wallich,† N. Esq. M.D. (Honorary Member.)
 Walters,*† Henry, Esq.
 Warner,† Edward Lee, Esq.

- Watkins, Thos. Esq. Katsooly, viâ Munglepore.
 Watson,† Major General Sir James, K.C.B.
 Watson,† John, Esq. Indigo planter.
 Watson,* Robert, Esq. Indigo planter, Calcutta.
 Watt, Robert, Esq. Indigo planter, Tipperah.
 Waugh, Captain A. S. Surveyor General of India, Allahabad.
 Wemyss, Capt. W. B. 9th Cavalry, Brigade Major, Meerut.
 Wemyss,† Captain James.
 Wight,* Robert, Esq. M.D. Madras Medical service, Superintendent Government Cotton plantations, Coimbatore.
 Williams, Fleetwood, Esq. Civil service, Budaon.
 Willis, Joseph, Esq. Merchant, Calcutta.
 Wilson, A. G. Esq. Deputy Magistrate, Gya.
 Wingrove, E. Esq. Merchant, Calcutta.
 Wise, J. P. Esq. Indigo planter, Dacca.
 Wodehouse, the Honorable W. E. Ceylon Civil service, Colombo.
 Woodcock, T. Parry, Esq. Civil service, Allahabad.
 Woodcock, E. E. Esq. Civil service.
 Woodcock, Lieutenant S. C. (Horse Artillery,) Meerut.
 Wood, George, Esq. Calcutta.
 Wray, L. Esq. Penang.
 Wyatt, Thomas, Esq. Civil service, Rungpore.
 Wylie, Macleod, Esq. Barrister, Supreme Court, Calcutta.
- Young, G. L. Esq. Indigo planter, Rungpore.
 Young, J. H. Esq. Civil service, Calcutta.
 Young, Lieut. J. nes, Artillery, Futtehpore.
 Young,† A. R. Civil service.
 Yule, J. W. Esq. Indigo planter, Tirhoot.

Monthly Proceedings of the Society.

(Thursday, 13th January, 1848.)

The Honorable Sir J. P. Grant, President, in the chair.

Elections.

Messrs. H. Doveton ; W. M. Floyd, C. S. ; Edward Hayworth ; Dr. Charles Palmer, and Baboo Eshanchunder Bhose.

Proposals.

Captain Andrew Thompson,—proposed by the Secretary, seconded by Mr. Staunton ;

S. Wauchope, Esq., Civil Service,—proposed by Baboo Ramgopaul Ghose, seconded by the Secretary.

The motion of which notice was given at the last meeting by Dr. Mouat, seconded by Col. Sage,—“ That any member retiring from the Society be exempted from the payment of a second admittance fee on re-election,”—was first brought forward ; and, after a few words in support from the mover and seconder, was put to the vote and unanimously agreed to.

Annual Reports.

A summary of the principal objects which have engaged the attention of the Society during the past year was submitted. The report states, in allusion to the internal economy of the Institution, that it “ continues to prosper, both as respects the accession of members and the improvement of its finances.” That “ the number of elections during 1847 has exceeded any one of the three preceding years ;” and that, after deducting life and honorary members, and those absent from the country, there remains 444 on the list of *paying* members. The report of the Finance Committee, and various statements connected with the receipts and disbursements, were next brought forward. After entering into various details explanatory of the pecuniary transactions of the Society during the past year the Committee close their report with the following recommendation :—“ The Committee beg to report to the Society that although there has been a continued improvement in the amount of their vested fund, they have been much disappointed in the hope they expressed last year of a reduction in the arrears due by some Members, and would now take leave to suggest whether some more stringent course should not be adopted against the defaulters. Perhaps,

the Society would not object to withhold all supplies of seeds, plants, and copies of the Journal from all members, whose subscriptions were 4 or 5 quarters in arrears; thus, by subjecting them to a practical inconvenience, endeavor to remind them of their monetary obligations to the Society."

Proposed by Dr. Mouat, seconded by Baboo Ramgopaul Ghose, and *resolved*,—"That the Finance Committee's report be confirmed and its recommendation carried into effect."

Proposed by Col. Sage, seconded by Mr. Alfred Turner, and *negatived*,—"That in addition to the measures proposed by the Finance Committee, the names of all subscribers in arrears, to the extent of 4 quarters due and upwards, to the Society, be published in the Presidency newspapers."

The reports were then transferred to the Committee of Papers for publication in the Journal.

Election of Office Bearers and revision of Standing Committees.

The meeting next proceeded to the nomination of Office Bearers for the current year, appointing Messrs. R. Watson and Laidlay as scrutineers, who reported that all the Officers of the previous year had been unanimously re-elected.

It was then proposed by Dr. Mouat, seconded by Mr. W. Haworth and carried,—"That the thanks of the meeting be rendered to the Officers of the Society for the attention they have devoted to the discharge of their duties during the past year."

The Hon'ble the President returned thanks on behalf of himself and the other Officers of the Society, for the vote awarded to them.

Dr. Mouat next remarked, that he should trespass but briefly upon the attention of the meeting. The proposition which he was about to submit for their consideration fortunately was one that required few words to introduce it, since it was intimately connected with the well-being and success of the Society during the last five or six years, and therefore well known to every member. All must admit that the Agri-Horticultural Society was not only the most flourishing and successful Association in India, but was the one which had most earnestly and honestly fulfilled its mission, and in the amount of real substantial good which it had effected was second to no Institution of the kind with which he was acquainted. That much, if not the greater part of this success, was due to the able and efficient manner in which the Executive Officers of the Society had performed their duties, he believed few would be inclined to deny or dispute. It was not his intention on the present occasion to make any specific allusion to the invaluable services of their excellent and respected President, since a more fitting opportunity would present itself hereafter for so doing. But there was another Officer to whom the Society owed a deep and lasting debt of gratitude for benefits conferred on it;—he referred to Mr. Hume, the Honorary

Secretary, a gentleman second to none in the community for talents of the highest order, and for an unflinching integrity in the discharge of his public duties. It would be unnecessary to remind those present of the peculiar circumstances under which Mr. Hume originally accepted the office, and most amply had he since fulfilled every hope then entertained of his usefulness. He had by his gratuitous services saved the Society a sum not very far removed from twenty thousand rupees, and this was in itself a strong and substantial recommendation to their gratitude : but he had higher claims upon them for the energy, ability and unwearied zeal with which he had constantly labored to advance their interests. Distinguished and efficient services had before been rewarded in a similar manner to that which he had now to propose : and although the honor was in itself, a very inadequate return, it would serve to mark the estimation in which Mr. Hume, and the principles upon which he had invariably and undeviatingly acted, were held by the Society. Such men are rare in any community, and in our's probably more required than in most others ; they ought therefore to be appreciated properly when found. Dr. Mouat concluded by moving :—

“ That as a small return for his distinguished and zealous services, as Honorary Secretary, Mr. Hume be elected an *Honorary Member* of the Society.”

The motion was seconded by Mr. Hugh Fraser, and carried by acclamation.

The Secretary thanked Dr. Mouat for the handsome manner in which he had introduced his name, and the Society for the honor conferred.

The revision and strengthening of the Standing Committees was then entered on, and gave the following result :—

Sugar.—Messrs. G. U. Adam, John Allan, James Cowell, William Haworth, and S. H. Robinson.

Cotton.—Messrs. J. Willis, W. Earle, G. U. Adam, and C. Huffnagle.

Silk, Hemp, and Flax.—Messrs. J. Willis, G. T. F. Speede, J. W. Laidlay, W. G. Rose, and Capt. A. Thompson.

Coffee and Tobacco.—Dr. Strong, Messrs. W. Storm, James Cowell, and Col. Sage.

Implements of Husbandry and Machinery.—Col. Sage, Messrs. H. Mornay, and J. M. Vos.

Oil and Oil Seeds.—Dr. Mouat, Messrs. W. Haworth, H. Mornay, James Cowell, John Allan, and Baboo Ramgopaul Ghose.

Grain Committee.—Messrs. Joseph Willis, W. Storm, W. Haworth, C. R. Prinsep, G. T. F. Speede, and Baboo Ramgopaul Ghose.

Nursery Garden Committee.—Messrs. J. W. Laidlay, R. Dodd, W. Hammill, W. G. Rose, and W. Storm.

Fruit and Kitchen Garden Committee.—Messrs. G. T. F. Speede, W. G. Rose, J. W. Laidlay, A. Harris, and Baboo Peary Chand Mittra.

Committee of Papers.—Dr. Mouat, Mr. J. W. Laidlay, Rev. Dr. Duff, and Col. Sage.

Finance Committee.—Messrs. M. S. Staunton, J. W. Laidlay, C. Huffleagle, and A. Turner.

Floricultural Exhibition.

A list of prizes awarded at the fourth quarterly show of flowers, held on 31st December, was submitted. The following are the remarks appended to the report :—

“ The collection was a fair one considering the general backwardness of the season. Several plants were brought forward, such as violets, heart’s-case, campanulas, larkspurs, pentstemon, linarias and sweet peas, which, not being anticipated, had not been introduced into the schedule of prizes. Not a single specimen of the above-named plants were to be seen at the show held on the 29th December 1846, nor of nasturtiums, portulacas and oxalis, for which prizes were awarded on this occasion. Chrysanthemums were tolerably well represented though the time for them is almost past ; phloxes and euphorbias (the jacquiniflora species) too were among the collection, fine healthy flowering individuals, notwithstanding the earliness of the season. The pinks were pretty fair ; there were a few fine plants of verbena, of maurandias, lophospermum scandens, bulbous plants,—and one well grown specimen of rondeletia speciosa. The balsams, (now out of season) jatrophias and salvias were very indifferent, while justicias, petunias and passifloras were not forthcoming, though included in the list. The collection of roses from Sir L. Peel’s garden was beautiful ; there was also a fair show of dahlias, considering the time of year. Altogether, the show may be regarded as a decided improvement on that of last year, and a fair and encouraging one. Messrs. Laidlay and Bartlett were the judges—the prizes were awarded by William Storm, Esq., V. P.”

Presentations to the Library.

The following donations were announced as having been received since the last meeting :—

1. Journal of the Asiatic Society of Bengal, Nos. 183, 184, and 185. *Presented by the Society.*
2. Journal of the Eastern Archipelago for October and November 1847. *Presented by the Editor.*

Garden and Museum.

1. Two oak seedlings, from a batch raised in his garden at Hoogly from Cape seed. *Presented by F. W. Russell, Esq., C. S.*
2. A few raspberry plants from his garden at Burkaghur, Chota Nagpore. *Presented by Col. Ouseley.*

3. A fine healthy plant of *Bignonia cherere*, and a new sort of *Ixora*. Presented by Geo. Wood, Esq.

4. A few seeds of *Poinciana regia*. Presented by S. P. Griffiths, Esq.

5. Five maunds of white linseed. Presented by Messrs. Willis and Earle, on behalf of Jeffrey Finch, Esq.

The following is an extract of Messrs. Willis and Earle's note, submitting the above seed, which, it may be remarked, is fully equal in point of size and color to the original stock received from Col. Ouseley :—

“About two years ago, you will remember giving us a small sample of the Nurbuddah white linseed for Mr. Finch, requesting a report thereon.

“This small quantity, Mr. Finch sowed in his garden the first year,—the produce was 20 seers.

“The 2nd year he sowed four large Tirhoot beegahs, with these 20 seers, which yielded only the five maunds now given to you, in consequence of about three-fourths of the crop, as Mr. Finch estimates, being destroyed by caterpillars. It is worthy of notice, that at the same time some common linseed grown in the vicinity of the white, was untouched by the caterpillars.

“Mr. Finch considers the soil in the south of Tirhoot too sandy for linseed.”

6. Three specimens of fibre and rope made therefrom, forwarded to him from the west side of India, namely, from Calicut, Ghote and the Concan. Presented by Capt. A. Thompson.

Capt. Thompson observes, that “these have been tested both at the arsenal and government dock-yards of this city, and proved perfectly equal to any and all purposes that cordage made of Russian hemp has hitherto been used for.”

7. A supply of *Deodar* and other hill seeds from the stores of the Sulapurpore botanic garden. Presented by Dr. Jamieson.

8. A further batch of tea seed from his plantation at Burkaghur. Presented by Col. Ouseley.

9. Sample of coffee grown at Fort Gloster. Presented by A. Brooke, Esq. This was pronounced a very fair quality coffee.

10. A small supply of seed of *Rubia nervosa* (Edgeworth). Presented by Major Madden.

Major Madden states this to be “a new and probably valuable species of madder, from 2,500 to 4,000 feet elevation, valley of the Seerjoo, below Ramesur, in Eastern Kemaon.”

11. A supply of wheat, vegetable and fruit seeds, also a small quantity of Tobolsk rhubarb seed. Forwarded by Dr. Royle from the India House, and received by the January Steamer.

A couple of the “straw-colored Otaheite” cane from the Society's Nursery garden were brought to the notice of the meeting. These canes, which are picked ones, are each from 12 to 13 feet long, measuring from the root to the leaf-joint, 6 inches in circumference, and nine pounds in weight.

A very beautiful and well-formed flower of the yellow chrysanthemum, 12 inches in circumference, from Mr. R. Wood's garden, was also placed on the table, and much admired by the Members.

Fibrous materials from Assam and Darjeeling.

A long and valuable practical report by Captain A. Thompson, the result of experiments made with certain fibrous materials from Assam and Darjeeling, which were sent down by Major Jenkins and Dr. Campbell, was next submitted, and referred to the Committee of Papers for publication in the Journal, as an appendix to the communications from those gentlemen. The report was accompanied by various specimens of line, rope and canvas, made by machinery, from the materials above referred to. Captain Thompson thinks most highly of the Pooah fibre of Darjeeling, and that "when properly dressed it is quite equal to the best Europe flax, and will produce better sail cloth than any other substance he has seen in India."

The best thanks of the Society were accorded to Capt. Thompson for his report.

Communications on various subjects.

The following letters were also submitted :—

1. From H. C. Tucker, Esq., acknowledging receipt of the presentation copy of Mr. Fenwick's prize essay, and returning his grateful thanks for the compliment.

The following inscription, signed by the President, is affixed to the copy :—

"Presented to Henry Carre Tucker, Esq., B. C. S., by the Agri-Horticultural Society of India ; as a slight acknowledgment of the lively interest he has taken in its affairs—evinced in many instances, and particularly shown in the title page of this volume."

2. From J. McClelland, Esq., forwarding a few copies of the private Journal and of the first part of the botanical papers of the late Mr. Wm. Griffith, and soliciting the aid of the Society in facilitating the sale of these works among its members.

"It is intended"—observes Mr. McClelland—"to invest in government security such sums as may be realized by the sale of those works (over and above the actual cost) for the benefit of his infant son. The government have subscribed most liberally for 250 copies of each of the works for distribution in Europe ; so that there only remain about 30 colored, and 50 plain copies of the *Icones* and *Notulae* now for sale, and it is proposed, that the price of the colored should be 20 Rs. and the plain copies 16 Rs. each. Of the Private Journals there are 240 copies available, and it is proposed that they should be disposed of at 16 Rs. per copy. The sympathy already evinced by the Society in the case of the late Mr. Griffith not only as one of its Vice-Presidents, but also as a distinguished votary of that branch of Science most

immediately connected with the objects of the Agri-Horticultural Society of India, renders any apology on my part unnecessary for further troubling the Society on this occasion."

In reference to the foregoing letter Dr. Mouat desired, seconded by Mr. Ridsdale, to give as a notice of motion for next meeting, "that the Society subscribe for three sets of the above works for its library."

Several members added their names for separate sets. It was also agreed that the works be advertised on the cover of the Society's Journal as long as it may be deemed necessary.

3. From S. Davenport, Esq., Secretary to the Society of Arts, dated London, 9th Nov. 1847, acknowledging receipt of the *Mowah* oil forwarded in April last, and stating he has received instructions to place it in the hands of different manufacturers to test its applicability for soap and candle making, or for any other useful purpose. Mr. Davenport also encloses a copy of the new prize list of the Society of Arts. The following extract shows such prizes, placed in the section of Colonies and Trade, as relate to India:—

"The Society's Gold Medal.—For the importation of any new plants likely to be useful as substitutes for the potato.

The Society's Gold Medal.—For the importation of any new substances which can be successfully used as substitutes for caoutchouc.

The Society's Gold Medal.—To the person who shall grow and prepare in the East Indies, or in any British Colony, the best specimen of tea, of good marketable quality.

The Society's Gold Medal.—For the best application of machinery as a substitute for manual labor, in the various processes of cultivation and manufacture of sugar, cotton, and coffee.

The Society's Gold Isis Medal.—To the person who shall raise the greatest quantity of flax, of good quality, in any of the British possessions in the East Indies or Australasia, being the produce of not less than five English acres.

The Society's Gold Isis Medal.—To the person who shall import at least two tons of any vegetable fibre which shall be equally cheap, strong, and durable, and applicable to all the purposes for which hemp is now used.

The Society's Gold Isis Medal.—To the person who shall import the finest quality of silk produced in the East Indies, equal to the best Italian or China silk.

The Society's Gold Isis Medal.—To the person who shall prepare in any British colony or Possession, and import into Great Britain, the greatest quantity, not less than one hundred pounds, of dried fruits, of good quality, similar to those now imported from the Mediterranean.

The Society's Gold Isis Medal.—For the cultivation of arrowroot, and its importation into this country, in a state fit for domestic purposes, to be sold at a cheap rate.

The Society's Gold Isis Medal.—For the importation or introduction into this country of any plants or trees, from China, India, or elsewhere, producing oils or fatty substances, such as can be used as food, or are applicable to manufacturing purposes.

The Society's Gold Isis Medal.—For the best sample of any new ornamental wood, suitable for the manufacture of furniture.

4. From Baboo Tarraucknauth Roy, of Maunbhoom, offering his services to translate Fenwick's *Hand-book of Gardening* into Bengalee, if the Society will be at the expense of publication.

Resolved,—That the matter be taken into consideration at the next meeting, and that in the meantime, the Secretary procure estimates of the cost of publishing such a work.

5. From Captain G. E. Hollings, Manager of the Branch garden at Lucknow, enclosing a list of the prizes given at the show of fruits, flowers and vegetables, held at the Residency Banqueting Rooms, on the 1st January; also a statement of expences and the means by which the garden has been maintained without requiring extraneous assistance of any kind. Capt. Hollings observes, that "judging from the opinions of those who attended, the show gave great satisfaction, and I have now reason to suppose that we have really attained some of the objects contemplated when the public garden was originally established."

6. From Major T. E. A. Napleton, Honorary Secretary Branch A. and H. Society, Bhauglepoore, submitting for the information of the Parent Society, an account of an exhibition of fruits, flowers and vegetables, held on the 3rd December.

The above two communications were transferred for publication in the Journal.

7. From Dr. C. Palmer, Secretary Branch A. and H. Society, Hooghly, intimating that their annual show will be held on the 18th January, and applying for the usual annual donation from the Parent Society.

The Secretary mentioned that this request had been met.

8. From "A Well wisher to the Society," submitting a short paper on the subject of certain indigo giving plants. Referred to the Committee of Papers.

At the close of the meeting the Secretary submitted for the inspection of the members a plan of the nursery garden, prepared in accordance with a resolution passed at a late meeting. He further brought again to notice the recommendation of the garden committee for a grant of Rs. 172 for the formation of an additional road in the nursery, which recommendation had been postponed, pending the preparation of a plan.

Resolved,—That the amount applied for, be now placed at the disposal of the Committee.

(Saturday, 12th February, 1848.)

The Honorable Sir J. P. Grant, President, in the chair.

Elections.

Captain Andrew Thompson and Mr. S. Wauchope, C. S.

Proposals.

Thomas Grant, Esq., of Azimnaghur factory, Bhaugleporc,—proposed by Mr. W. Duff, seconded by Mr. Heatly ;

Baboo Duckinarangun Mookerjee,—proposed by Baboo Peary Chand Mitra, seconded by the Secretary ;

J. H. Mather, Esq., Civil Engineer,—proposed by the Secretary, seconded by Dr. Hufnagle.

Presentations to the Library.

1. Madras Journal of Literature and Science, No. 32. *Presented by the Society.*

2. Journal of the Asiatic Society of Bengal, No. 186. *Presented by the Society.*

3. Journal of the Indian Archipelago, No. 6. *Presented by the Editor.*

4. Five copies of the late Mr. Griffith's private Journals and Travels in India, and of his *Icones Plantarum Asiaticarum*, and *Notulæ ad Plantas Asiaticas*. *Presented by the Government of Bengal.*

Garden and Museum.

1. Five Durian plants and one of *Amherstia nobilis*. *Presented by George Moxon, Esq.*

2. A further supply of wheat and barley seed, received by the February Steamer. *Forwarded from the India House by Professor Royle.*

3. A further supply of seed of *Cedrus Deodara*. *Forwarded by Dr. Wm. Jamieson.*

4. A specimen cane grown in his garden at Burkaghur, Chota Nagpore, from Otaheite stock, furnished to him by the Society. *Presented by Capt. R. Ouseley.*

Capt. Ouseley states, that the largest canes in a plot of 450 weigh 16 pounds, and are 18 feet in height.

The motion of which notice was given at the last meeting ;—"That the Society subscribe for three sets of the late Mr. Griffith's publications for its Library," was first brought forward. In the absence of the mover and seconder, Dr. Hufnagle proposed, seconded by Col. Sage, that the motion be adopted. This was met by an amendment from the Secretary, seconded by Mr. Laidlay, that the consideration of the motion be postponed till next meeting, to admit of the attendance of the original mover and seconder, their absence on the present occasion being unavoidable.—*Carried.*

Horticultural Exhibition.

A list of prizes, amounting to three silver medals and Rs. 174, awarded at a show of vegetables and-fruits held on the 4th of February, was submitted. The following are the remarks appended to the schedule—"This exhibition was an excellent one, even better than that held in February, 1847. Upwards of 200 mallees attended, their baskets were ranged in six rows, extending the entire length of the Hall. The cauliflowers exceeded the other vegetables in number, nearly all well grown specimens. Of Brocoli there were a few bunches, and one specimen of Brussels sprouts; Scotch kale fairly grown, and endive well blanched, were likewise submitted for competition, also several baskets of coss and cabbage lettuce in fair perfection; cabbages, turnips and carrots, were exceedingly well represented; of the first named there was an unusually large display, of the more delicate varieties, viz. York, Savoy, Battersea. The celery was an improvement on that of last year, and the potatoes decidedly so. Several baskets of good descriptions of peas, the Prussian blue, imperial, marrowfat and prolific, were brought forward. There was a larger assortment than usual of the squash tribe, also a few samples of asparagus and artichoke, both early in the season. Brigadier Frith's gardener showed a basket-full of vegetable marrow, raised at Dum-Dum from English seed. The *mallees* of Mr. Bartlett and the Society's garden submitted some excellent cobs of maize, which, though produced out of season, were fully equal to the original stock from America.

The indigenous vegetables were limited; of fruits too the display was small, but among them were several good sapotas, loquats, rose-apples, pine-apples and oranges.

Messrs. Laidlay and Speede selected the prize specimens, and Mr. William Storm, V. P., distributed the amount awarded (Rs. 174).

Silver medals were given for the best-specimens of potato, turnip and celery. The fourth medal was withheld, the basket of Windsor bean not being considered sufficiently good to entitle the owner to it.

The Patron of the Society.

*The Secretary having intimated to the meeting, that the departure of Lord Hardinge had caused a vacancy in the office of Patron of the Society, it was agreed, that a deputation, consisting of the President, Vice-Presidents and Secretary, do wait on the Right Honorable the Governor General, with the view of requesting His Lordship's acceptance of the office. The President undertook to ascertain on what day it would be agreeable to Lord Dalhousie to receive the deputation.

An improved Cotton-cleaning Machine.

A letter was read from G. A. Bushby, Esq., Secretary to the Government of India, forwarding for the information of the Society, copy of a memoran-

dum by the Agent Cotton Experiments, in the N. W. Provinces, descriptive of several kinds of cotton newly introduced into those Provinces. Referred to the Committee of Papers.

In connection with the above subject, the Secretary drew the attention of the meeting to several papers having reference to a new cotton-cleaning machine or "improved Indian Churka," manufactured by Mr. J. H. Mather, Civil Engineer, of the above-mentioned experimental cotton works; more particularly to two reports of Mr. Simms, Consulting Engineer to the Government of India, drawn up at the request of Mr. Bushby, for the information of the Lieutenant Governor of Agra, and to a report of Messrs. Munro and Morrison, Carding and Spinning Masters, late of the Lancefield Spinning Company, Glasgow, at present attached to the Fort Glo'ster works. The first communication of Mr. Simms, which is dated 10th January last, enters into detail regarding the new machine, and points out in what consists the difference between it and that invented by the late Mr. Owen Potter; the second, dated 11th February, gives the result of his visit the previous day to Fort Glo'ster, (where the machines are in course of preparation) in the following words:—

"I have much pleasure in reporting, that one of the cotton-cleaning machines is complete, and appears to answer admirably, the remainder are in an advanced state. I enclose for your information a report by Messrs. Munro and Morrison, whom, as practical men lately arrived from England, I requested to give me their opinion upon the cotton when turned out from the Churka."

Report by Messrs. Munro and Morrison.—"We have very carefully examined the small cleaning machine for cotton, which has lately been made up at these mills for Government, and it appears to be a very considerable improvement on the native Indian churka, which we have also seen at work.

"The cotton turned out from the native churka is always in a matted state, and the fibres lying confused in different directions, and when it comes to the mill the "Carder" has a good deal more trouble with it than he has with the "American" cotton used in England, which always comes to hand with the fibres lying in the same direction or nearly so,—there is also a good deal of dirt and waste always to be found in the cotton cleaned by the Indian churka, which defies all our endeavors to remove.

"This new machine, however, has the great advantage of having a Fan attached to it, on the arms of which strong whalebone brushes are fixed, and beneath the fan is a light iron grating; the action of the brushes not only serves to shake out the dirt, &c., from the cotton, but it also has the effect of opening out the fibres and laying them similar to the American cotton above noticed, and delivering in a state far better suited for the carding engine than that cleaned by the churka.

"We have seen a considerable quantity of seed cotton passed through the new machine, it was however the cotton of an old crop, which had become *parched* and dry, and was therefore much more difficult to separate from its seeds than the cotton of the current crop would be, but notwithstanding *this serious disadvantage* we fully consider that the new machine turns out cotton quite as clean as it is desirable to have it brought to the mill, and that any further expence in picking it over with the hand or applying additional machinery to it would be quite thrown away, and as regards the straightness of the fibres would be probably injurious."

A report on experiments made at Agra before a Committee appointed by the Lieut.-Governor to test the machine preparatory to further steps being taken in the matter, was also submitted, together with a memorandum of Mr. Mather, descriptive of various parts thereof, the addition made to it, and the mode of working. Mr. Mather closes his paper with the following remarks :—

"The construction of the machine is extremely simple, and in order to expedite its *introduction among the natives*, the form and appearance of the native churka have been adhered to in its construction, and the manner of feeding the rollers *by hand* is also similar. EVERY PART of the machine can be made up in India, and the cost of each machine (if a number are made up at the same time) will be about Rs. 60."

At the close of the perusal of the above papers, Mr. Mather having previously expressed his wish to be a competitor for the prize offered by the Society, it was agreed, that the members of the "Cotton Committee" and "Committee for implements of husbandry and machinery" should form themselves into a special committee for the purpose of reporting on the working of his churka. Further, that Mr. Simms be requested to join the committee, and that public notice of the day of trial be given, to enable such other members of the Society as may be desirous of witnessing the operation, to meet at the Metcalfe Hall for that purpose.

Communications on various subjects.

The following papers were also submitted :—

1. From J. Thornton, Esq., Secretary to Government, N. W. P., transmitting a communication from Mr. J. G. Bruce, Deputy Collector at Cawnpore, containing observations on the culture of wheat in India, and the practicability of exporting it to the English market.

2. From G. A. Bushby, Esq., Secretary to Government of India, forwarding copies of correspondence with the Medical Board on the subject of supplying the medical stores of this presidency with Senna grown in the vicinity of Agra and Muttra.

3. From J. Forsyth, Esq., Secretary Medical Board, on the same subject, and furnishing extract from Professor Royle's work on *Materia Medica*.

4. From Captain Andrew Thompson, submitting a report on certain specimens of the "Rheea" fibre of Assam.

5. From Mr. D'Cruz, furnishing a favorable report on the germinating qualities of an assortment of English vegetable and grain seeds, received from Dr. Royle by the January Steamer.

The above communications were referred to the Committee of Papers.

6. From Baboo Tarraucknauth Roy, Principal Sudder Ameen, Maunbhoom, offering in continuation of his former letter, to bear the expence of printing an edition in Bengalee of Fenwick's Hand-book of Gardening, should the Society not be disposed to incur the cost.

It was agreed, that a sum not exceeding the amount expended on the first edition be reserved for the above work ; and the Secretary was requested to communicate with Baboo Tarraucknauth Roy on the subject.

At the close of the meeting a conversation was held on the subject of the defective columns of the Hall, and it was proposed by Col. Sage, seconded by the President, and resolved,—“that the following three civil architects, Messrs. Vos, Grey and Mackintosh, be requested to examine the two defective columns in the east portico of the Metcalfe Hall, and report whether the same can be rebuilt on the present foundation with an assurance of ultimate safety ; and if not, what other measures they would recommend to ensure the safety of the colonnade.”

(Thursday, 9th March, 1848.)

The Hon'ble Sir Lawrence Peel, Vice-President, in the chair.

Elections.

Messrs. Thomas Grant, J. H. Mather, and Baboo Duckinarangun Mookerjee.

Proposals.

The Hon'ble F. Drummond, C. S.,—proposed by Major Napleton, seconded by the Secretary ;

J. G. Bruce, Esq., Deputy Collector, Cawnpore,—proposed by the Secretary, seconded by Mr. Bushby ;

Capt. Alexander Meik, H. M. 94th Regt.,—proposed by Mr. W. G. Rose, seconded by Mr. W. Storm.

The Patron and Patrons of the Society.

The Honorable the Vice-President informed the members, that in pursuance of the resolution of the last meeting, a deputation consisting of the Office-bearers of the Society, had waited on the Right Honorable the Governor

General ; that His Lordship had most readily consented to accept the office of Patron of the Society, and promised to promote its views to the best of His ability : His Lordship further intimated, that Lady Dalhousie would have much pleasure in becoming Patroness of the Society.

In connection with the above, the Secretary read the following letter from Lord Dalhousie :—

To JAMES HUME, Esq., Secretary to the Agricultural Society.

MY DEAR SIR,—Feeling myself now a member of the Agricultural Society, I beg to enclose to you a cheque for Rs. 500, which I propose to transmit to you annually, so long as I may remain in India.

I remain, Dear Sir,

Very faithfully your's,

Govt. House : Feb. 19th, 1848.

DALHOUSIE.

Resignation of the President.

The Secretary read the following letter of resignation from the Hon'ble the President of the Society :—

To JAMES HUME, Esq., Honorary Secretary, Agri-Horticultural Society.

MY DEAR SIR,—I am compelled by the state of my health under the advice of my medical attendants to quit Calcutta with the least possible delay ; I therefore proceed home by the *Earl of Hardwicke*.

I cannot take leave of the chair of the Agricultural and Horticultural Society, which I have now occupied for several years, without expressing my deep sense of the kindness which I have uniformly experienced, and the candid and efficacious support in the discharge of my duty which the Society has uniformly afforded me. Although I am sensible of the very small service I have been able to render to the Society, I hope they will believe that this has proceeded from no want of a deep sense of the great and important services to the Horticulture and Agriculture of India the Society has rendered, and is capable of rendering to a still greater extent, if its affairs shall continue to prosper in the same degree in which they have for by-gone years.

It is unnecessary for me to enlarge upon the sense which I, in common with the other members of the Society, entertain of the great share your conduct as its Secretary has had in this result.

I beg you to state to the Society the deep interest I feel in its continued prosperity, and

I am, my dear Sir,

Most sincerely your's,

7th March, 1848.

J. P. GRANT.

The Secretary next submitted draft of an Address in reply to the above letter. After a few verbal alterations, it was moved by Dr. Huffnagle and unanimously agreed, that the address be adopted ; and that as the early departure of Sir John Grant precludes its circulation for the signature of the members generally, Sir Lawrence Peel be requested to sign it as Vice-President of the Society and Chairman of the meeting. .

TO THE HON'BLE SIR JOHN PETER GRANT, KNIGHT.

&c., &c., &c.

SIR,—We were prepared for your early departure from India, which we have regarded as a serious loss to our Society. It is with deep regret we learn, that the event is to be hastened by indisposition, and the first wish we have to express is that your health may be speedily restored.

We cannot, Sir, permit you to resign the President's Chair without expressing our sense of the zeal, discretion, and ability with which you have filled it ; and in the services you have thus rendered, we have the best assurance of the deep interest you feel in the great objects for which the Agri-Horticultural Society of India exists. It was our good fortune to secure your services in succession to those of a President who commanded public respect by his devotion to all objects of public utility : the same trait of distinguished philanthropy will long preserve your name and character in the grateful recollection of the people of Calcutta ; but your steady attention to the affairs of this Institution, your invariable courtesy and impartiality, promoting a cordial co-operation—so essential to success—demand on your retirement our special acknowledgments. We have no hesitation, Sir, in tendering them for and on behalf of the Society, and in bidding you an affectionate Farewell.

Proposal for the Establishment of Annual Exhibitions of Cattle and country produce at the Titalya Fair.

Read the following letter from Dr. Campbell, Superintendent of Darjeeling, dated Camp, Feb. 11, 1848 :—

To JAMES HUME, Esq., Secretary, Agri-Horticultural Society.

MY DEAR SIR,—Will you do me the favor to submit the enclosed proposition for the establishment of annual exhibitions and prizes for country produce at the Titalya Fair to the Agricultural Society, with a request that the subscribers and donors may be favored with any opinions and suggestions that may occur to the members as likely to facilitate the end in view. If the Society can afford some medals, or a donation in cash, it will be very gratifying and useful.

With reference to Major Napleton's proposition to restrict our present operations to prizes for Cattle, and that we should import seed grains from

England for the purpose of distribution, I am inclined to think that much good may be done without going to this expence; and involving the delay it would entail in the commencement of our operations. The grains grown on this side of the Ganges—with the exception of rice, and except in the southern parts of Purneah, are of the worst possible description. It therefore appears to me that we may, with prospect of advantage, import seed grains from Bhaugulpore, Patna and the Nurbudda, waiting until we are more in funds before we go so far as Europe, for the means of making a beginning. To the above end I purpose soliciting the aid of Major Napleton to select the best grains and oil seeds procurable in his neighbourhood for distribution on this side of the Ganges. Will the Society favor me with 20 printed copies of the Circular for distribution, according to the Hon'ble Mr. Drummond's proposition, and announce that the first Cattle show will take place at the Fair in December 1848. It is proposed, that from each of the districts named a subscriber shall sit on the Annual Committee of distribution.

A. CAMPBELL.

Circular.—Many Members of the Agricultural Society and others who are interested in the improvement of Agriculture and Cattle-breeding in the districts of Rungpore, Purneah, Dinagepore, Bogra, Rajshahye, Bhaugulpore, Moorshedabad and Malda, as well as in the territories of Bootan, Sikim, Nepal, and Cooch Behar, are of opinion, that the same may be attained to a considerable extent by instituting a system of Annual Prizes to be distributed at the Titalya Fair, and to this end it is proposed, that the first exhibition shall take place at the Fair in 1848. A subscription of Rs. 5 is requested from all those who are disposed to aid the project. Suggestions and additional donations will be thankfully received, and Dr. Campbell will receive the amount subscribed and keep it at the credit of the subscribers until the next meeting of the Fair, when the arrangements for distributing the prizes, &c., &c., will be entered into. In the meantime it is proposed, that all subscribers shall spread the intelligence of the exhibition and encourage the Natives of their neighbourhood to come forward and compete for the prizes.

(Signed) A. CAMPBELL,

Superintendent, Darjeeling.

Proposed by Major Napleton.—As a commencement it is deemed expedient to notify, that the first Cattle show will take place during the Fair of 1848, when prizes will be awarded,—

1. For the best Darjeeling Cow.
2. For the best ditto Heifer.
3. For the best Cow, bred on the plains (in the districts notified.)
4. For the best Heifer, bred on the plains in the districts named.
5. For the best pair of Hackery Bullocks, bred on the plains in the districts named.
6. For the best pair of Plough Bullocks.

7. For the best Plough.
8. For the best Hackery.
9. For the best Galloway or Pony, bred in the Rungpore districts.
10. For the best Galloway or Pony, bred in any other of the districts named, including Bootan and Sikim.
11. For the best gram-fed Bullock.
12. For the best Bullock, fed on oats and gram.
13. For the best Horse, not of country breed, bred in those districts.
14. For the best Sheep and Lamb, ditto ditto.

In respect to that part of Agricultural produce where cereal grains are concerned, it is believed that the only sure plan of improving them would be to send to England for barley and oats in particular, and then distribute the seed as extensively as possible. The following year the acclimated produce might be brought forward at harvest time for competition for prizes, and a central spot fixed on for testing; the cereal grains and potatoes acclimated from Darjeeling, Bombay and Cherra Poonjee seed, might be brought forward for competition for prizes at the same time.

It will be evident to all, that the cereal grains, &c., grown in the districts named, at the present time, are chiefly of a very inferior quality, and that to bring forward indigenous produce or award prizes for it, would not in any way tend to the improvement of Agricultural produce.

(Signed) T. E. A. NAPLETON.

Proposed, that printed copies of this Circular be sent to the different districts named, for distribution to the planters and others.

(Signed) FRED. DRUMMOND.

Resolved,—That the Society, cordially approving of the proposal referred to in Dr. Campbell's letter, do give an annual donation of Rs. 100 or silver medals of that value, to aid in carrying out the objects contemplated by the originators.

Floricultural Exhibition.

A list of prizes amounting to Rs. 152, awarded at the first quarterly show of flowers, held on the 1st of March, was next submitted. The following are the remarks appended to the list :—

"This show was decidedly the best in every respect that has been held in the Town Hall. The competition was more spirited than heretofore. Upwards of thirty gardeners were present; and prizes were awarded to 23. There was a large collection of the more common order of exotic annuals, such as clarkias, larkspurs, &c., and many well grown specimens of the rarer sorts,—heart's-case, phloxes, portulacas, sweet-peas and such like. Verbenas of 4 or 5 sorts, oxalis of as many kinds, begonias, and sweet-williams were well represented. In the department of tuberous and bulbous plants were several pots of irises, lilies, a ferraria, and a few anemones and ranunculuses.

Among the orchideous tribe were a few plants of *bletia*, *vanda* and *dendrobium*. A small collection of rarer kinds of plants were likewise submitted, viz., *banisteria*, *brachycome*, *petrea*, *poivre*, *combretum*, and *bugginvillea*. A few plants of the double daisy were also introduced.

Dr. Falconer and Captain Hollings were the judges. The prizes were distributed by Wm. Storm, Esq., V. P.

A memorandum proposing certain fixed periods for the three other flower shows which are to be held during the year was also submitted, and referred to the garden committee for adjustment.

Election of a President and Vice-President.

The Hon'ble the Chairman having intimated, at this stage of the proceedings, that public duties obliged him to leave the meeting, Mr. William Storm, V. P. was voted into the chair. It was then proposed by Col. Sage, seconded by Baboo Ramgopaul Ghose, V. P., and carried by acclamation,—that Sir Lawrence Peel be elected to the office of President in the room of Sir John Grant. It was next moved by Mr. Staunton, seconded by Mr. Robert Watson, and carried unanimously,—that Dr. Charles Huffleagle be elected a Vice-President of the Society in the place of Sir Lawrence Peel.

Presentations to the Library, Garden and Museum.

The following presentations were announced :—

1. *Icones Plantarum, Indiarum Orientalis*, or Figures of Indian Plants, by Dr. R. Wight ; parts 2, 3, and 4 of vol. 3, and part 1 of vol. 4. *Presented by the Govt. of India.*

2. Lindley's *Natural System of Botany*, and Ward's *Treatise on the growth of plants in closely glazed cases*. *Presented by R. Dodd, Esq.*

3. A pair of engraved diagram returns by Dr. Royle, indicative of the prices exported of Indian as compared with American cotton, during a long series of years. *Presented by Dr. Falconer on behalf of Dr. Royle.*

4. An assortment of cereal grains and flower seeds brought out by him in the last steamer. *Presented by Dr. Falconer on behalf of Dr. Royle.*

5. Two nutmeg plants. *Presented by George Wood, Esq.*

6. Specimens of wood, fibrous materials and cotton, the produce of Assam. *Presented by Major Jenkins.*

The following is an extract of Major Jenkins' letter regarding the above specimens :—

"I shall send you by this steamer, a small parcel as follows :—two small samples of wood, No. 1, one of our Korois, *Acacia serissa* I believe, which is abundant about this, you will have had it before I suppose,—it is a very tough wood, and appears to partake so much of the nature of sissoo, that I should think it might be used for all the rough works, as gun-carriages, in which sissoo is employed. It would be less adapted for fine works.

"No. 2. Is a piece of fine grained wood, but I know not its name, perhaps you may find it by comparing it with the samples sent down before. Both these specimens come from Mr. Grose.

"No. 3. Is another specimen of a flax used by the Nāgas, sent me by Major Hannay, it is made from a large creeper, the leaves of which accompany, and I suppose from them that it is a *Bauhinia*; the plant is not uncommon about this.

"No. 4. Is a specimen of a primitive cloth made by the Garrows from the bark of a tree, whose leaves are enclosed in the parcel; they make several such cloths of different colors, from various barks, and though these manufactures would seem cheap enough, they are not usually at the expence or labor of even such rough clothing for themselves—preferring apparently to go naked; they import at least 100,000 mds. of cotton, but to my knowledge do not weave a seer for themselves. The Garrows who come to the plains have generally some small ends of cloths—but these are bought from the Bengalees, apparently to attend the *hauts* in, not as clothing to protect them from wind and weather.

"We have a colony of Kuhis, lately come up from Triparee, who wear no clothing whatsoever. Yet these same Kuhis are great growers of cotton, so they do not go naked from necessity, but from choice.

"No. 5. Is a bag containing quarter maund of the ordinary *kupas* of this neighbourhood, which I send you, partly as a sample of our cotton, and partly that you may try your churka, and see how it operates in cleaning this cotton."

The Secretary mentioned, that a portion of the *kupas* had been transferred to Mr. Mather to be cleaned by his new churka, and that the result would be communicated at the next meeting.

Communications on various subjects.

The following letters were also submitted:—

1. From H. C. Tucker, Esq., Collector of Gorruckpore, forwarding copy of a memorandum by Mr. W. Cook, a landholder in that district, regarding the various kinds of wheat grown at Gorruckpore, their selling prices, and the practicability of export to the English market. Referred to the Committee of Papers.

2. From Major Napleton, Honorary Secretary, Branch Agri-Horticultural Society, Bhauglepore, submitting an account of a horticultural exhibition held at that station on the 11th of February. Also acknowledging receipt of the Parent Society's annual donation.

3. From W. Gilmore, Esq., Secretary Branch Society, Cuttaek, forwarding a report of a show of vegetables and flowers held at that station on the 10th February.

4. From R. W. G. Frith, Esq., stating that the list of plants indented for by the Society from the Botanic Garden at Trinidad, has been transferred to

Captain Thornhill, of the *Duke of Bedford*, who has promised to endeavor to obtain them.

5. From Messrs. Vos, Mackintosh and Grey, reporting, according to a resolution of the last meeting, on the state of the eastern portico of the Metcalfe Hall.

Resolved,—That tenders be invited for replacing the defective columns.

The Secretary having stated that the above comprised all the business before the general meeting,—it was agreed, that the meeting be now made *special*; whereupon, it was proposed by the Secretary, seconded by Col. Sage, and resolved unanimously ;—“ That in addition to the address already voted, this meeting invite their late President to sit for his picture in England to be placed in the Hall of the Society, and that the Treasurer be requested to receive subscriptions from individual members for that purpose.”

A list was handed round the table, and subscriptions to the amount of Rs. 484 were received before the meeting broke up.

(Thursday, 13th April, 1848.)

The Honorable Sir Lawrence Peel, President, in the chair.

Elections.

The Honorable F. Drummond, C. S., J. G. Bruce, Esq., and Capt. Alexander Meik, H. M. 94th Regiment.

Proposals.

Arthur Adams, Esq., Railway Commissioner,—proposed by Mr. F. Skipwith, seconded by the Secretary ;

Lieut. Thomas Rattray, (64th N. I.) Adjutant Ramghur local force,—proposed by Capt. H. J. Guise, seconded by the Secretary ;

H. Davidson, Esq., Civil Service,—proposed by the Secretary, seconded by Dr. Mouat ;

James Bedford, Esq., Assistant to Commissioner of Assam,—proposed by Major Jenkins, seconded by the Secretary ;

H. Biddle, Esq., Superintendent of the Bengal Coal Company's Collieries,—proposed by Mr. James Stuart, seconded by Dr. Mouat ;

J. P. Kelly, Esq., Civil Assistant Surgeon, S. W. Frontier Agency,—proposed by Col. Ouseley, seconded by the Secretary ;

E. A. Blundell, Esq., Civil Service,—proposed by the Secretary, seconded by Dr. Mouat ;

E. Radcliffe, Esq., Civil Service,—proposed by Mr. H. Brownlow, C. S., seconded by the Secretary ;

C. H. Marks, Esq., Calcutta,—proposed by Mr. S. P. Griffiths, seconded by Mr. W. Stalkart ;

C. McLeod, Esq., Calcutta,—proposed by Mr. W. G. Rose, seconded by Mr. W. Storm.

Presentations to the Library and Garden.

The following donations were announced :—

1. The Calcutta Journal of Natural History, No. 30. *Presented by Dr. McClelland.*

2. Journal of the Indian Archipelago for January, February and March, 1848. *Presented by the Editor.*

3. Copies of the same work from July, 1847 to January 1848. *Presented by the Government of Bengal.*

4. Journal of the Asiatic Society of Bengal, Nos. 147 and 148. *Presented by the Society.*

5. Speede's New Indian Gardener (two copies). *Presented by the Author.*

6. Two mango grafts and two grafts of *Prunus triflora*. *Presented by Rajah Sutt Churn Ghosaul.*

7. A further supply of seed of *Nerium tinctorium*, or indigo yielding tree. *Presented by Dr. Wight.*

8. A supply of Himalayan seeds, consisting of *Cedrus Deodara*, *Cupressus torulosa*, and *Pinus Gerardiana*. *Presented by the Secretary.*

The Secretary mentioned that these seeds had been most obligingly forwarded to him by Mr. Brian Hodgson of Simla, who states that the first named kind had been gathered and most carefully dried by his own collectors ; the other two sorts were sent to Mr. Hodgson by Capt. Patrick Gerard.

9. A collection of various kinds of maize raised from American stock at the Society's garden, and at the gardens of Messrs. Meik and Chambers.

Though grown out of season, being sown in November and December, these specimens were nearly equal in size of grain and ear to the original stock.

10. Twelve seers of Jaunpore maize seed. *Presented by Mr. R. Chambers.*

These seeds, Nos. 7, 8, 9 and 10, are now in course of distribution to members.

11. A fine assortment of seeds of bajra, jowar, millet, and vetches of sorts, and of country vegetables. *Presented by Capt. G. E. Hollings.*

The Secretary intimated, that Capt. Hollings had forwarded these seeds, at the request of the Society, for Major Jenkins, to whom he had despatched them by steamer, as also a portion of the Jaunpore maize above referred to.

The following letters from Sir John Grant and Sir Lawrence Peel were first submitted :—

JAMES HUME, Esq., *Honorary Secy. Agri-Horticultural Society.*

Dear Sir,—I have to acknowledge the honor of receiving from you the Address of the Agricultural and Horticultural Society at their meeting of the 9th instant, and of the addition to that Address inviting me to sit for my picture in England to be placed in the Hall of the Society.

It is impossible for any thing to be more gratifying to my feelings, or, permit me to add, more greatly exceeding my deserts than these testimonies of the approbation of the Society of my conduct in its chair; and I beg you to assure them of my grateful sense of it, and that I shall always take the warmest interest in hearing of the welfare of the Society.

I shall have much pleasure in sitting for my Picture as they were kind enough to desire, and I request that you will do me the favor to communicate to me, as soon as convenient, of what size it is desired that the Picture should be, and of what price.

I have &c.,

Calcutta: 11th March, 1848.

(Signed) J. P. GRANT.

My dear Sir,—I appreciate fully the honor conferred upon me by my election to be the President of the Agricultural and Horticultural Society of India, and I beg of you to express to those who have conferred this honor upon me my grateful sense of their kindness. I succeed to one whose urbanity of manners, whose strict impartiality in the chair, whose unremitting zeal and attention to the affairs of the Society, have justly gained him the approbation and the thanks of the Society over which he presided. I will do all that in me lies to diminish his loss to the Society, but I feel that I should overrate my own qualifications for the office, if I thought myself able to equal him.

Believe me, &c.,

10th March, 1848.

(Signed) LAWRENCE PEEL.

The Secretary stated, that the subscription list for a Picture of the late President amounted at the present time to Rs. 1,652, of which Rs. 1,200 had been collected.

The motion of which notice had been given at a previous meeting by Dr. Mouat, "That the Society subscribe for three sets of the late Mr. Griffiths' publications for its library," was next brought forward, supported in a few words by the mover and by Col. Sage, and unanimously agreed to.

Floricultural Exhibitions.

The following memorandum from the Garden Committee was next read;—

"In presenting the annexed list of prizes for the second quarterly show of flowers, the Garden Committee beg to suggest the propriety of settling beforehand the time when the 3rd and 4th shows of the current year will be

held, with the view of enabling competitors to have a longer time for preparation. They would propose that the 3rd quarterly show take place about the end of October,—a good time for dahlias, roses, climbers of sorts, and certain indigenous plants ; and the last show of the year in all December, for early exotic annuals, &c. ; the exact day of the month being determined on hereafter, three weeks or so before each exhibition.”

The suggestion of the Committee was agreed to. Further, Dr. Falconer, Col. Sage and Dr. McClelland were requested to act as judges at the show to be held on the 15th instant.

Communications on various subjects.

1. From J. Thornton, Esq., Secretary to Government, N. W. P., forwarding additional papers on the cultivation of wheat in India, and the practicality of exporting it to the English market.

Mr. Speede submitted to the meeting a communication to his address from Mr. Vaux “on the best method of cultivating English seedcorn in India,”—which, together with the papers on the same subject submitted at the last meeting, were referred to the Grain Committee.

2. From Major T. E. A. Napleton, presenting a detailed account of the rise and progress of the Branch Agri-Horticultural Society at Bhaugleporc.

The best thanks of the Society were given to Major Napleton for this interesting statement, which was referred to the Committee of Papers.

3. From Dr. Robert Wight, forwarding, in continuation of his former communication, which was submitted at the meeting of September 1847, a printed circular on the subject of Mexican cotton cultivation, with special reference to the sowing season.

4. From Lieut. John Eliot, Artillery, Cawnpore, giving the result of his sowings of various batches of garden, flower and farm seeds, received last year from the Society.

5. From Dr. Falconer, reporting on certain specimens of leaves, &c. forwarded by Major Jenkins from Assam.

6. From the Society's Gardener, submitting the results of the sowing of a supply of seeds, cereal and flower, forwarded by Dr. Royle by the overland mail, and by favor of Dr. Falconer.

The Secretary intimated, that he had despatched a copy of this memorandum to Dr. Royle by the March mail. He had likewise furnished Dr. Falconer with a copy.

7. From Lieutenant W. H. Parish, Artillery, Kangra. After entering into a few particulars regarding the sites selected by Dr. Jamieson for tea cultivation in that locality, the writer closes his communication as follows :—

“This cold season we have had a fall of snow in the Kangra valley, like the one of last year. It covered the ground to the depth of about an inch, and being followed, as before, by smart frosts, it did considerable damage to

the plantains and other delicate trees. Here the severest weather occurs pretty regularly about the end of January, and the beginning of February of each year. It usually breaks up with heavy falls of rain, accompanied with thunder and lightning and with violent gusts of wind.

"Between Kumleh-gurh and Kulec I met with the mangoe, the peepul and a species of palm (*Phoenix sylvestris*? Rox.) growing at, what appeared to me to be, rather high elevations. I found them at quite 1,000 feet, if not more, above Mundi-nuggur; and I believe, that town has been fixed at 3,500 feet above the sea. On the other hand two species of oak, (*Q. incana* and *Q. semiserrata*?) appear to thrive in the Kangra valley at very low elevations, viz., from 2,500 to 3,000 feet. In the forest of Tulluknauth, I noticed the peepul growing out of these oaks. As my last letter to the Society had the effect of drawing forth remarks on the plantain from able hands, I trust that this one will be as fortunate."

All the above communications were referred to the Committee of Papers.

8. From Col. Sleeman, seeking information on behalf of Capt. C. O'Brien, of the Nuseecree Battalion, regarding the planting of trees for the purposes of fuel. The subject was referred, at the suggestion of the Secretary, to Dr. Falconer, who was solicited to give the information required.

9. From G. F. Speede, Esq., presenting two copies of his New Hand-book of Gardening.

The thanks of the Society were accorded to Mr. Speede; it was also agreed, on the motion of Dr. Mouat, that the Society subscribe for two copies of the work.

10. From J. H. Mather, Esq., enclosing the following report from Mr. Munro, Carding Master at Fort Gloster, on the Assam *kupas* raised at Gowhatti, received from Major Jenkins, and referred to in the last month's proceedings:

"The staple is far too short and coarse for English machinery, unless for very low counts, such as No. 10 or 12, and there appears to have been very little care taken in picking the *kupas*, as it is full of broken, rotten, and dirty seeds. I think that if proper attention was paid to the growing and picking of this cotton, it may probably be found suited for native manufacture by hand spinning—but I fear that its staple will never be profitable for machine spinning even at the counts above-mentioned. From what I saw of the cleaning of the above-named *kupas* by the new churka, I have no doubt that if the *kupas* be properly picked (in the same manner as the Agra *kupas*) the new churka will clean it effectually, but a rather smaller wooden roller would be an advantage on account of the extreme shortness of the staple." Mr. Mather remarks,—“As far as I am able to form an opinion (from my knowledge of the description of cotton forwarded from the Madras Presidency to China,) I should be inclined to think, that if proper attention be directed to the subject, especially to the picking, this cotton would suit the China

market. The new churka clears this *cotton* from its seed effectually, notwithstanding the shortness of its staple,—but owing to the unusually large quantity of broken seeds and dirt contained in the “*kupas*,” the cotton, when turned out from the churka, is not so clean as the “Agra” cotton; but this defect would no doubt be remedied in any future samples of Assam *kupas* by a little common attention to picking, for though the *length of staple* is a matter probably beyond the control of the cultivator, there can be no reason whatever why the *kupas* should not be as cleanly picked as in other districts.”

•The Secretary mentioned, that he had lately received from Major Jenkins some other and cleaner picked samples of *kupas* from Suddiya, which had been forwarded to him by Capt. Vetch; and these he had also transferred to Mr. Mather, for report to the next general meeting.

11. From J. Thornton, Esq., Secy. to Govt. N. W. P., expressing the Hon'ble the Lieut.-Governor's satisfaction at the manner in which Dr. Jamieson's report on the cultivation and manufacture of tea in Kemaon and Gurhwall has been printed.

For the above communications and presentations the best thanks of the Society were accorded.

(Thursday, 11th May, 1848.)

The Honorable Sir Lawrence Peel, President, in the chair.

Elections.

Lieut. Thomas Rattray; Messrs. Arthur Adams; H. Davidson, C. S.; James Bedford; E. A. Blundell, C. S.; E. Radcliffe, C. S.; C. H. Marks; H. Biddle; C. McLeod, and Dr. I. P. Kelly.

Proposals.

John McClelland, Esq., Medical Service,—proposed by the Secretary, seconded by Dr. Moaut;

R. Montgomery, Esq., Civil Service,—proposed by Lieut. John Eliot, seconded by the Secretary;

J. Warrander Dalrymple, Esq., Civil Service,—proposed by Dr. Hufnagle, seconded by the Secretary.

Presentations to the Library, Garden and Museum.

The following donations were announced:—

1. Journal of the Royal Asiatic Society, No. 3 of vol. 10. *Presented by the Society.*

2. Journal of the Indian Archipelago for April, 1848. *Presented by the Editor.*

3. Copies of the same work for February and March 1848. *Presented by the Government of Bengal.*

4. An assortment of Pelargonium and other plants. *Presented by L. Manley Esq.*

5. A few cobs of American maize of superior sorts. *Presented by Dr. Royle.*

6. A soursop of a fair size, the produce of his garden at Howrah. *Presented by J. Chew, Esq.*

7. A bottle of rose-water, procured by distillation from the rose-apple. *Presented by Col. Ouseley.*

Col. Ouseley, in sending this specimen, observes—"I have just made a discovery that promises well in places where roses do not thrive, if the rose-apple (*Goolab jamun*) ripens well;—most excellent rose-water can be distilled from the fruit, taking the seed out first. I had it distilled *four* times, and it proved equal to the best rose-water, to the great surprise of the distiller."

8. Specimen of fibre from the "Aroosha" of Chittagong, *Callicarpa cana*. *Presented by A. Sconce, Esq.*

9. A supply of Gibali, Cuba and Bhilsa tobacco seed, the produce of the Society's nursery garden was also placed on the table, and is available for distribution.

Flower Show.

A list of plants, for which prizes were awarded at the second quarterly exhibition of flowers held on the 15th of April, was submitted, and the following remarks appended to the list were read:—

"This show was in every respect an excellent one; the best that has yet been held in the month of April. The collection was equally as large as that submitted at the second quarterly exhibition of 1847, and there were more novelties. Among the rarer perennial sorts brought forward were *Solidago Canadensis*, *Limonia splendens*, *Jacquinia ruscifolia*, *Cordia Sebestena*, *Rondeletia speciosa*, and a species of *Fuschia*. Several of the less common kinds of annuals were also introduced, such as *Brachycome*, *Salpiglossis*, &c.; while the more common descriptions,—*Phloxes*, *Portulacas*, *Iberia*, *Silene*, &c., were well represented. The competition was altogether spirited. The produce of some 25 gardens was submitted, and prizes awarded to twenty. Col. Sage and Dr. McClelland officiated as judges. Mr. W. Storm V. P., distributed the prizes, amounting to Rs. 169."

Exhibition of Vegetables and Fruits.

The Garden Committee submitted a schedule for the next horticultural exhibition, amounting to Rs. 170 and two silver medals. The schedule was confirmed, and Saturday, the 27th of May, was the day fixed for the show.

A letter was read from Robert Burn, Esq., dated Edinburgh, 1st March, advising despatch, per *Duke of Wellington*, of his cotton-cleaning machine to compete for the prize offered by the Society.

(Wednesday, 8th June, 1848.)

The Honorable Sir Lawrence Peel, President, in the chair.

Elections.

Dr. McClelland, R. Montgomery, Esq., C. S., and J. W. Dalrymple, Esq., C. S.

Proposals.

Lieut.-Colonel G. Congreve, C. B., H. M. 29th Regiment,—proposed by Major R. Houghton, seconded by the Secretary ;

W. Wienholt, Esq., Merchant,—proposed by Mr. T. B. Swinhoe, seconded by Mr. M. S. Staunton ;

Lieutenant William Hay, Artillery,—proposed by Lieut. John Eliot, seconded by the Secretary.

Presentations to the Library, Garden and Museum.

The following presentations were announced :—

1. Journal of the Indian Archipelago for April (2 copies). *Presented by the Government of Bengal.*

2. Journal of the Asiatic Society of Bengal, No. 189. *Presented by the Society.*

3. Southey on Colonial Wools. *Presented by Mr. P. S. D'Rozario.*

4. Twenty-five seers of white linseed, a quantity of coffee, and a further specimen of rose-apple water. *Presented by Col. Ouseley.*

5. Specimen of tobacco from Assam. *Presented by Major Jenkins.*

6. A fine specimen of the ordinary Indian corn, as grown in Fort Leschenault, Western Australia. *Presented by C. R. Prinsep, Esq.*

7. An assortment of Chinese seeds. *Presented by Geo. Wood, Esq.* The Secretary mentioned, that these seeds had been transferred for trial to the Society's garden, and that several kinds had already germinated.

8. A specimen of the "Mahogany" of Western Australia, *Eucalyptus (robusta ?)* ; also a specimen of the wood and seed of the "raspberry jam" tree of the same locality. *Presented by Dr. Tatlock.*

A fine assortment (consisting of 110 sorts,) of seeds of American forest and ornamental trees, shrubs, &c., also 31 specimens of veneer woods. *Presented by Dr. Huffleagle.*

(These seeds are available to members.)

10. A few curiously formed mangoes. *Presented by G. T. F. Speede, Esq.*

The following is an extract of Mr. Speede's note :—" I send you a sample of mangoes of rather curious appearance from the neighbourhood of Sooksagur,

they appear almost reticulated externally, and internally appear divided into two distinct parts that can be detached from each other, the one a pulp so stringy as to be almost inedible, the other around the stone soft and good but of a peculiar flavor. The natives attribute the appearance and peculiar flavor to the presence around the trunk of the trees—the roots of each intermingling with the other—of a number of custard-apple trees, which they imagine to have intermingled in nature, or in fact to have hybridized with the mangoe; but this is impossible, the genera being so distinct;—the coincident appearance is however singular.”

11. A larger supply of the bark of the “Oadal” tree (*Sterculia vilosa*).
Presented by Major Jenkins.

12. Twenty-nine mounds of the pods of the “Teree” of Chittagong (*Cassipouia* —?). *Presented by A. Sconce, Esq.*

In his communication advising the despatch of this supply, Mr. Sconce observes,—“I do not remember if I ever mentioned to you that these pods are used here to give a black dye. Could any of your practical chemists be induced to favor the Society with a report upon the Teree as a dye-stuff? Is this property of dyeing black calculated to have any effect prejudicial or beneficial upon the uses of the pods for tanning?”

In reference to the above the Secretary mentioned that, at his request, Dr. O’Shaughnessy had kindly undertaken to test the quality of this pod as a dye-stuff. Further, that the greater portion of the supply had been transferred to Mr. Teil, to enable him to carry into effect, his obliging offer to ascertain, by a series of experiments on an extended scale, the exact strength of the tanning properties of this pod compared with the Dividivi and other substances. The Secretary added, that the Oadal bark had been sent to Captain Thompson, that gentleman having kindly offered to have it converted into rope, and its strength fairly tested with Manilla hemp.

Horticultural Exhibition.

A list of the prizes, amounting to Rs. 107, awarded at the second quarterly show of vegetables and fruits, held on the 27th May, was submitted. The following are the remarks appended to the list:—

“The collection of cabbages of sorts,—sugar-loaf, savoy, drumhead, Brussels’s sprouts, &c., was very fair, considering the time of year; the turnips, carrots, lettuce, beet and artichokes were also well represented. The celery was very indifferent; and the asparagus, though tolerably good, was not equal to that submitted at the second quarterly show of last year.

“In the fruit department, the display of peaches and mangoes was excellent. Several baskets of sapotas, soursops, pomegranates and pine-apples were likewise brought forward, but only one of litchee, the late heavy falls of rain having destroyed it. Some fine bunches of purple and white grape from Mr. Stalkart’s garden at Goosree were introduced; a money prize was award-

ed to the gardener for them in lieu of a silver medal which was given last year.

“ Though the number of specimens were not equal to those submitted at the exhibition of May last year, this show may be considered altogether an encouraging one, the quality of many of the articles compensating for the deficiency in quantity. Mr. Speede and Baboo Pearychand Mitter, selected the specimens, the prizes were awarded by Baboo Ramgopal Ghose, V. P.”

Report on Coffee and Tobacco from Chota Nagpore and Assam.

The minutes of the Members of the coffee and tobacco committee, regarding the samples of coffee and tobacco alluded to among the presentations, were next read. The members are of opinion, that the coffee sent down by Col. Ouseley, the produce of his garden at Burkaghur, is a superior article, the berry being of an even size, and of a healthy and plump appearance, and requiring only age to rank it amongst the finest qualities produced. As regards the tobacco, grown at Gowhatti by Mr. Grose, (from what seed is not mentioned) and forwarded by Major Jenkins, the committee consider it as in no wise superior to common Bengal tobacco, and inferior to that of Tirhoot and Chunar ; it is small leaved and discolored from having been gathered at different stages of growth ; the quality is mild and fragrant, but not well adapted for the manufacture of segars. One of the members states, that “ it appears to be of the same indigenous stock as is brought here by the Mugs from Arracan, but of more careful and tender cultivation. Its present value in the Calcutta market may be assumed at about Rs. 3½ per maund.”

The Secretary desired, at this stage of the proceedings, in connection with the above report and with the communications which had been read from Col. Ouseley, to call the attention of the meeting to a letter from a zealous member, Mr. James Cowell, expressive of his opinion that Col. Ouseley's continued efforts to show so fully, as he has done, the capabilities of the Province under his charge for coffee culture, and his services generally in aiding to carry out the objects for which the Society is established, merited its special notice ; and further suggesting, in due appreciation thereof, the award of a gold medal to that gentleman. The Secretary then read a memorandum, drawn up from the records of the Society, detailing the nature of those services ; and, after a few observations in support of the proposition of Mr. Cowell desired, seconded by Dr. Hufnagle, to give the following notice of motion for the next general meeting :—

“ That a gold medal be awarded by this Society to Lieut. Col. J. R. Ouseley, Governor General's Agent, S. W. Frontier, in token of the Society's sense and recognition of his continued exertions in bringing to its notice, and in improving the vegetable products of the district under his charge, as well as the valuable grains and seeds of Central India.”

Communications on various subjects.

The following papers and letters were also submitted :—

1. From B. H. Hodgson, Esq., sending sample of the silk of the wild worm of the saul forest, with cocoon of the wild (large) and tame (small) silk-worm of the saul forest ; also drawing of the moth, caterpillar, cocoon and chrysalis of these worms ; and desiring an opinion on them.

2. From R. W. G. Frith, Esq., offering as requested by the Society, a few remarks on the subject of Mr. Hodgson's communication. Mr. Frith recognizes the larger insect in the drawing to be the Tusser silk-worm of India, and the smaller, the Arrindy or Eria worm of Assam and the North-Eastern parts of Bengal.

3. From Dr. Falconer, submitting, as requested at a former meeting, a memorandum in reply to Captain O'Brien's queries (forwarded through Col. Sleeman) respecting timber trees and materials for fuel.

4. From Dr. R. Wight, offering a few additional remarks on the best time for planting the new Orleans cotton plant in India.

5. From Major T. E. A. Napleton, forwarding a very favorable account of a show of vegetables, fruits and flowers, held by the Bhaugleypore Branch Society on the 26th of May.

6. From Mr. Frith, giving an extract from a recent number of *Curtis' Botanical Magazine*, regarding *Aristolochia angucida*, which is said to be a specific against snake-bites.

The above six communications were referred to the Committee of Papers.

7. From Lieutenant W. H. Parish, on the subject of the introduction of certain Indian fibrous yielding plants, and the more valuable description of Himalayan orks into England ; also of the introduction into this country of some good description of vegetables as fodder for cattle.

The Secretary mentioned, that he had referred this communication to Dr. Falconer, who had favored him with a reply to the following effect :—

"With regard to the suggestion about the introduction into England of fibrous yielding plants, I beg to state, that I am not aware of any species adapted for acclimatization in England, with any reasonable prospects of success, to recommend specially for introduction.

"As to the suggestion respecting the valuable descriptions of oak, the seeds of all the species common on the hills of the North-Western Provinces have been repeatedly despatched from the Botanic Garden at Saharunpore during many years past. The species occurring in the hills around Darjeeling are less perfectly known and have been less frequently collected. The Society would be rendering an important service by procuring fresh acorns, of the Darjeeling species, and transmitting them to its correspondents in England.

"The introduction of a good fodder material for cattle would be an invaluable boon, and the Society, with reference to this object, cannot do better than persist in its endeavours to procure the "*Panicum spectabile*" of Brazil."

8. From Dr. D. J. Macgowan, dated Ningpo, 23rd March, intimating that he is making the enquiries referred to him by the Society about the plant yielding the China grass-cloth, and will communicate the result hereafter. Dr. Macgowan adds—"I am not prepared to say that the hemp of China is identical with the plant [*Urtica tenacissima*] you describe, but I am strongly of opinion that it is."

9. From Capt. F. C. Burnett, giving the following brief description regarding the suitableness of the climate of the Jullunder Doab for gardening operations :—

"I dare say you would like to hear a short account of this interesting country, which is a very great contrast to Bengal, being very dry, with a great scarcity of trees, the soil very sandy and light but most prolific; all it requires is plenty of irrigation which is easily procurable, the water being found anywhere on digging in the soft soil for about 12 or 14 feet. I have a very good garden, with two wells, and almost all day the water is being conducted by small aqueducts all over the garden. I have apple, quinee, pear, plum, mangoe, peach, strawberry and melon plants; they thrive well, as well as all the orange tribe. At present almost all the English vegetables are over, except the artichoke, which is in perfection; I can cut about twenty a day for about two months; the green peas are just over. With regard to English flowers, they thrive here as well, if not better than in England; sweet-peas, double stock, escholtzias, candytuft, lupins and innumerable other flowers growing most luxuriantly. I have also some fine portulacas and petunias, sweet-william and pinks, and a variety of roses and fuschias.

"This climate is delightful, the thermometer this morning (4th May) at sunrise was at 60°, and most beautifully clear and dry."

10. From Mr. P. S. D'Rozario, forwarding a copy of Mr. Southey's work on "Colonial Wools," and drawing attention to the following extract of that gentleman's letter to his address :—

"Should a selection be made from that portion of the work which relates to the improvement in the condition of India wool, and translated into the language of those districts (or countries which produce wool), it cannot fail to prove to the benefit of those who may pay attention to the suggestions therein contained."

11. From Mr. Speede, submitting a specimen of an abridged version of his "New Indian Gardener," in Bengalee, and soliciting some degree of encouragement and patronage from the Society.

Referred to the Committee of Papers.

For all the above communications and presentations the best thanks of the Society were accorded.

(Thursday, 13th July, 1848.)

The Honorable Sir Lawrence Peel, President, in the chair.

Elections.

Lieut.-Colonel Congreve, C. B., W. Wienholt, Esq., and Lieut. William Hay.

Proposals.

Major General Sir W. R. Gilbert, K. C. B.,—proposed by the Secretary, seconded by Dr. Hufnagle ;

G. Hewett, Esq., Deputy Magistrate, Cutwa,—proposed by Mr. W. G. Rose, seconded by Mr. W. Storm ;

Richard Spooner, Esq., Bombay Civil Service, Ahmednuggur,—proposed by Captain W. O'Brien, seconded by the Secretary ;

Cornet Crabtree, II. M. 3rd Light Dragoons, Umballa,—proposed by Major R. Houghton, seconded by the Secretary ;

Arnold Henry Matthews, Esq., Simla,—proposed by the Secretary, seconded by Dr. Hufnagle ;

Capt. E. G. Champneys,—proposed by Colonel Sage, seconded by Dr. McClelland.

Presentations to the Library, Garden and Museum.

The following donations were announced :—

1. Journal of the Indian Archipelago for May 1848, and supplement to No. 6 of vol. I. *Presented by the Editor.*

2. Two copies of the same work, for the same period. *Presented by the Government of Bengal.*

3. Report of the Royal Society of Arts and Sciences at Mauritius, presented at annual general meeting in August 1847. *Presented by the Society.*

4. Journal of the Asiatic Society of Bengal, No. 190. *Presented by the Society.*

5. A quantity (about 12 maunds) of Carolina seed paddy. *Presented by the Government of Bengal.*

The Secretary mentioned, that this seed had been tried in the Society's Garden, and found to germinate very freely.

6. A bag of tea seed, supposed to be from China stock. *Presented by Major Jenkins.*

In his note advising the despatch of this seed, Major Jenkins states, "should any gentlemen be desirous of obtaining tea seed, I could get a large quantity at a trifling cost about October or November, by giving a previous order."

7. A quantity of seed of the "aloo bokhara" plum, the produce of his garden at Burkaghur. *Presented by Col. Ouseley.*

8. A supply of Cape acorns. *Presented by Messrs. Villet and Son.*

9. Seed of the *Pandanus vacoa*, or screw-pine. *Presented by the Royal Society of Arts and Sciences of Mauritius.*

All these seeds are available to members.

10. Twenty-four seers of acclimated Mexican cotton seed, the produce of the Government farms at Coimbatore. *Presented by Dr. Wight.*

The Secretary stated he had lost no time, on receipt of this seed, in despatching it, with copies of Dr. Wight's Circular, to several members in different parts of the country, and had requested the favor of their communicating to him the result of their experiments.

11. Four samples of the common cotton of Province Amherst, grown in the upper portion of the Salween river. *Presented by Capt. Phayre.*

12. Two specimen candles made from the oil of the "Mowah" tree, *Bassia latifolia*; and a small quantity of the oil in a clarified state. *Forwarded by J. Stikeman, Esq., Secretary E. I. and China Association.*

Award of a gold medal to Col. Ouseley.

The motion of which notice was given at the last meeting, "that a gold medal be awarded by this Society to Lieut.-Col. J. R. Ouseley, Governor General's Agent, S. W. Frontier, in token of the Society's sense and recognition of his continued exertions in bringing to its notice and in improving the vegetable products of the district under his charge, as well as the valuable grains and seeds of Central India,"—was first brought forward; and after some remarks by the proposer and seconder, and a few other members, was put to the vote and carried.

Report on indigenous cottons from the Tenasserim Coast.

A communication was read from Capt. Phayre regarding the cotton samples alluded to among the presentations. Capt. Phayre states, that these are "specimens of the common cotton of Province Amherst, grown in the upper portion of the Salween river. The specimens were obligingly procured for me by M. Burot, a French Gentleman residing here, [Moulmein.] He informs me that the cotton meets with ready sale at Bordeaux. Samples marked Nos. 1 to 3 inclusive are specimens of cotton cleaned with the ordinary *churka*. Sample No. 4 is cotton with seed. It contains cotton from four or five different places."

Dr. Hufnagle reports on these samples as follows:—

No. 1. General appearance good, and color good also—clean and free from stains, showing that it has been carefully picked and at the proper season; fibre weak (probably injured by the *churka*). The staple short.

No. 2. Very clean and of good color, not so fine and silky as No. 1, but I think with a longer and better staple.

No. 3. More woolly, but very similar to No. 2, perhaps not so carefully cleaned, but like the others, in my opinion, a very good sample of Indian cotton. All these samples resemble more "Upland Georgia" than any other description of American cotton.

No. 4. Kuppas,—staple short, and seed very difficult to separate from fibre.

Mr. Cowell concurs with Mr. Hufnagle's remarks on these cottons, which he considers "good, and suitable for the English market: Nos. 1 to 3 particularly so. If they can be produced at about Rs. 7½ to 8 per bazar maund, cleaned, they would answer to send home at low freight." Mr. Cowell enquires, if much of this cotton is grown in the Tenasserim province, and the cost of its production, and if the attention of Government has ever been directed to it.

The Secretary was requested, in transmitting the above report to Capt. Phayre, to solicit additional information on the subject, especially in reference to the enquiries of Mr. Cowell. It was further agreed, that the Society avail itself of the obliging offer of that gentleman (made in a separate communication) to send a portion of these musters home for the opinion of the Brokers, and that the parcel be consigned to the care of Mr. Stikeman.

Application of the Oil of the "Mowah" (Bassia latifolia) to economical purposes.

The following report on a quantity of "Mowah" oil which was placed at the disposal of the Society by Mr. C. B. Taylor, and forwarded last year to Mr. Stikeman, Secretary E. I. and China Association, with a view to ascertain its market value and its applicability for the manufacture of candles and soap, was next submitted. The letter (under date 1st May) is addressed to J. Stikeman, Esq., and signed by Mr. G. T. Wilson, Managing Director of "Price's Patent Candle Company":—

"I beg to inform you, that the Mowah oil, of which you furnished us samples, is worth in this country for the manufacture of candles, eight pounds per ton less than Petersburg tallow. We have tried a great many experiments upon it, and found it to be of the same value as cocoa-nut oil, as its being harder makes up for the color being inferior. Large quantities could be used in this country at about £35 per ton.

"I send some candles and oil, but fear that the former will not remain in a solid state through the voyage to India. We have however processes secured to us by which we can make candles from Mowah oil sufficiently hard for the Indian market."

Mr. Wilson states in a subsequent communication, that he has not been able to forward a sample of soap made from this oil by this opportunity, but hopes to do so shortly.

The Secretary intimated, that notwithstanding the care bestowed by Mr. Stikeman in the packing of these samples, with the view of enabling them to resist the changes of temperature to which they would be subjected during the voyage, they had reached him in a half liquified state.

The best thanks of the Society were given to Mr. Stikeman for the trouble taken by him in meeting its wishes. It was also directed that the report be published for general information, a copy being previously forwarded to Mr. Taylor.

Measures for improving the Agricultural and Horticultural produce of the Punjaub.

Read the following letter from Major R. Napier, of the Engineers, Durbar Chief Engineer at Lahore, seeking the Society's co-operation for the improvement of the Agricultural and Horticultural produce of the Punjaub :—

"I take the liberty of intruding on your time to beg your assistance in carrying out a plan, which has been decided on at Lahore, for the improvement of the Agricultural and Horticultural produce of the Punjaub.

"We have excellent gardens belonging to the Lahore State at Shalimar, near Lahore, and at Amritsir, with numerous smaller gardens scattered all over the country. Each of these gardens is furnished with numerous mallees paid by the State, but much neglected since the time of Runjeet Sing.

"It is at once evident how much good may be done throughout the country by means of these establishments, in disseminating improved kinds of grain, fruits, and garden seeds.

"A great deal of the sugar-cane grown is of so poor a description, that it is not sent to the mill, but merely sold to the poorer people, who eat it in great quantities.

"The Punjaubees take very readily to European vegetables, which are extensively cultivated near Lahore.

"It is proposed therefore to establish Central Gardens at Lahore and Amritsir, and from thence to supply the District Gardens with the improved produce for distribution to the zemindars.

"May I request the favor of your aid in the above plan by your advice, and by furnishing a supply of such grain and garden seeds as your experience may lead you to suggest, and for which I beg to enclose a draft for 100 Rupees, to cover the expences of packing, &c.

"Amongst the seeds which it would probably be most advisable to send, I may mention European garden seeds of all kinds, both vegetable and flower; any fine kind of wheat, oats, barley, sugar-cane, cotton, clover, rice, &c., &c."

The Secretary mentioned, that with the view of more effectually aiding Major Napier in the important object embodied in his communication, he had sought the assistance of Dr. Falconer, Superintendent H. C. Botanic Garden; and had now the pleasure to submit the following remarks with which that gentleman had obligingly furnished him :—

"I have perused Major Napier's letter regarding the important object of turning the State Gardens in the Punjaub to advantage in improving the cultivated products of the country, by introducing and disseminating improved sorts, and I shall be most happy to contribute any available materials from this Institution, to further so desirable an object.

"The Shalimar Garden at Lahore, founded by the Moghuls, is of great extent, and possesses the very important advantage of easy irrigation—an invaluable condition of a garden, during the dry months, in a hot parched country like the Punjaub; and I have little doubt but European vegetables, &c., will be cultivated with great success. Major Napier's head of desiderata

are so comprehensive, that there is little left to add, except a few hints in the way of detail. Of *Cereal grains*, maize is extensively grown in the northern parts of the Punjab, and forms a large portion of the food of the inhabitants. It is especially abundant along the outer hills and lower vallies of the Himalayas. The cultivated sorts might, with advantage, be replaced by some of the most productive kinds of Indian corn grown in the United States ; and which the Society is often in the way of receiving.

"*Rice*.—The kinds found in the Hills along the Punjab, and in the valley of Peshawur beyond it, are of the finest description, and far superior to any thing cultivated in this part of India. The *Bara rice* of Peshawur and the *Bonsmuttee rice* of Cashmere may be mentioned as examples. The Society might probably with advantage forward some of the large-grained rice, of the southern states of North America, so extensively in demand in Europe.

"The *Wheats* grown in the Punjab are chiefly the *hard* or "*steely bodied*" sort—the "*Daood-Khane*" being the most common ; and in sending supplies the Society had perhaps better direct its attention to the "*soft*" or "*farinaceous*" wheats which are less abundant.

"With regard to Major Napier's remark about the miserable condition, frequently exhibited by the sugar-cane, the fault lies more probably in wretched cultivation than in the nature of the cane : more especially want of manuring, and of sufficient irrigation. The Punjaubees are so far in advance of the people of Hindoostan, that they use opposed rollers for the expression of the juice, instead of the ineffective and power-wasting "*Koloo*" of Hindoostan. And the "*Nubat*" (sugar-candy) of Cashmere, prepared from Punjab sugar, was of a very superior quality, and used to be exported to Affghanistan, Persia, and Central Asia, bearing a large price.

"*Vegetables*.—Every thing in the shape of Europe vegetables may be expected to succeed—and the Society cannot be too liberal in its supply both as regards quantity and variety.

"With regard to fruit trees, a great variety of very excellent kinds of apples and pears are grown in Cashmere. Some of the pears are delicious, but they do not keep, and will not stand carriage for exportation to the plains. The cherry also, "*glass*" and several other European kinds of fruit, with the finest description of grapes, are cultivated extensively in Cashmere. These could all be brought with great facility down to Lahore, and by establishing a correspondence with the Lahore and Amritsar gardens, the Society might annually be able to procure supplies for transmission to Europe. A new branch of the Society's operations opened in this direction I regard as one of the most important and promising to which its attention could be directed ; and I strongly recommend the subject to the consideration of the Council.

"There is one tree adapted for growth in the more arid regions of the Punjab, which I would specially recommend to the attention of the Punjab institution ; namely, the carob tree of Syria, or *Ceratonia siliquastrum*, the seeds of which are used for food in years of scarcity."

In reference to the concluding paragraph of the above communication, the Secretary mentioned that the suggestion of introducing the carob tree had been also urged some years ago by Dr. Lindley, as the following extract of a paper addressed by him to the Court of Directors, bearing date January 1839, would show. The paper in question, having reference to the interchange between Asia and Europe of the trees and plants, the produce of each other's soil, is reprinted in the seventh volume of the Transactions of the Society :—

“The carob tree, a native of Syria, and the hottest parts of the South of Europe.

“This forms a large tree, which bears in abundance pods filled with a nutritious substance. It is tenacious of life in a singular degree, and seeks its nourishment far from the surface of the ground, on which account it suffers little from the long continuance of drought. The pods are a common article of food in the countries where the tree is found, and are by some supposed to be the “locusts” on which St. John fed in the wilderness ; they are sometimes sold in the fruiterer's shops of London. During the Peninsular war, the pods were found of great value as food for cavalry horses, and I entertain no doubt that if the tree could be extensively introduced into the milder parts of Northern India, it would render the famines we read of almost impossible. Seed of this might be obtained conveniently in Egypt.”

Resolved,—That the best thanks of the Society be given to Dr. Falconer for the above suggestions and offer of assistance. That a copy thereof be sent to Major Napier, and his attention be particularly requested to the introduction of the fruits of Cashmere into the State gardens of the Punjaub : and further, that every aid consistent with the means of the Society, be accorded to Major Napier in enabling him to carry out the desirable objects above referred to.

Proposal for the interchange of Agricultural Seeds between the various districts of India.

Read the following communication from Dr. Campbell, Superintendent of Darjeeling, suggesting a liberal interchange of Agricultural seeds between the various districts of India :—

“I must beg of you to apologize to the Society for me in not having sooner acknowledged your kind and satisfactory letter of the 11th March last, announcing the cordial approval of the Society to the proposed annual exhibition at the Titalya Fair of cattle and country produce. Pray offer the thanks of the subscribers to this scheme to the Society for the annual donation of 100 Rs. in cash or in silver medals, and allow me to request, that for the coming exhibition we may have 4 medals and the remainder in cash. I shall draw upon you for the cash when I know the cost of the medals.

“The extract you sent me from a note of Dr. Royle's is satisfactory, as confirming my notion of the propriety of distributing the best sorts of Indian grains in districts which grow inferior sorts : rather than delay all efforts at

improvement until we are able to import the very best sorts from Europe. The distribution of good sorts of cereal and other grains, pulses, oil seeds, &c., is a matter of the highest importance to the improvement of the country ; and almost above all others most worthy of the attention and care of the Agricultural Society and its detached members. I wish I could quicken attention to this matter.

“ Do not however think that I would advocate the distribution of grains over this vast and fertile lands in pounds, and by means of “overland” and bhanga parcels. This is altogether useless and unworthy of the great object in view—the amelioration of the condition of the people through the increased production of their soil.

“ It ought to be done by thousands of maunds and in boat-loads, wherever there is a navigable stream or river, and where there is not, by strings of hackeries and brinjari bullocks throughout all the inland districts from Cape Comorin to the Sutledge. You will say that the Agricultural Society has not the pecuniary means to attempt even this good work, and this is probably the case, but that is not a sufficient reason for overlooking the subject, if it shall be found practicable to accomplish it ; and if the Society is satisfied that great good would accrue to the country from the adoption of a plan to put the scheme in execution, it would give me great pleasure to find that the Society took up this extended project in the cordial spirit by which it met the local project now in train of experiment. If it does so, I would suggest that it apply to its own members for any sums they may be disposed to advance on loan without interest for a period of five years, the money to be employed under the direction of the Society, with the aid and sanction of Government, by its local officers in distributing the best sorts of Indian Agricultural seeds through the districts which now grow inferior sorts. The distribution to be by sale, and if possible at no sacrifice of money. If a strong disposition to the project is shown by the members, and substantially evinced by loans, I would propose that the Society solicit the further assistance of Government by advancing a lakh of rupees or such sum as may be sufficient for the purpose under whatever guarantee it may approve ; the money to be used at least five years for the above purpose, at the end of which period the Government and the Society to determine the extent of benefit conferred on the country, and whether it shall be continued. I am greatly mistaken in my anticipations if the result would not be most satisfactory ; and what could more appropriately grace the conclusion of the present Charter than the exhibition of a substantial favor conferred on the working population of the country by such means. The Agricultural Society is the most fitting body to take the initiative in such a scheme, and I hope it will do so. It would not be difficult, I think, to organize machinery for the execution of the plan. The preliminary steps would be to ascertain from the Revenue Authorities, Members of the Society, and others, in what districts really good grains are grown ; and in what districts the inferior ones only prevail.

"The former would be selected to furnish the annual supply for the latter. Then it would be necessary to procure the aid of the Revenue Authorities, planters and others, to ascertain what quantity of seed would be taken annually in each district, and the rate at which it would be readily purchased. In some districts a profit might accrue from this rate. In others there might be some loss. The seeds might in all cases be consigned to the collectors on their indent, the same to be leased on the enquiries above noted, and they would be the best persons to distribute them, and realize the proceeds, placing the same by orders of Government to the credit of the Agricultural Society or whatever body may be appointed or approved by Government in communication with the Society for the important work. This faint outline of a plan will soon receive extension—or be overlooked for a better one if the Society will but entertain the project. Pray let me know how it is received, and believe that if I can in any way help it to maturity, I shall do so with all my heart. Every step taken by the Society to benefit the *people* of India is one in the right direction, it is doubtful, I think, how far its efforts to contribute to the tastes and fancies of its European members by shows of flowers, fruits and vegetables, are conducive to its real interests or a judicious mode of expending its resources."

In connection with the above communication, the Secretary submitted a memorandum, drawn up from the records of the Society, showing what steps were taken on the occasion of a suggestion, of a somewhat similar nature to that of Dr. Campbell, made about six years ago by Mr. Ravenshaw, then Commissioner of Revenue for Behar. After some discussion, in the course of which the advantages to be expected from such a scheme were fully admitted, and the difficulties in the way of accomplishing it pointed out, it was *resolved*, that the subject matter of this communication, requiring more matured consideration than can be given to it at a general meeting, be referred for report to the "Grain and Finance" Committees conjointly.

Proposed introduction of the Darjeeling species of Oak into England.

The Secretary informed the meeting that, in accordance with the suggestion of Dr. Falconer, as recorded in the last month's proceedings, he had requested the assistance of Dr. Campbell in procuring fresh acorns of the Darjeeling species of Oak for transmission to England. He had now the pleasure to submit an extract of a letter from that gentleman in reply, as also a second communication from Dr. Falconer on the same subject:—

"I have the pleasure to acknowledge the receipt of your's of the 15th instant, and in reply to state, that I observed Dr. Falconer's proposal to send fresh acorns of the oaks from this part of the world to England; and that I purposed at the proper season sending some to the Society to enable it to meet the proposition. In November next I hope to fulfil your wishes on this point, as that is the best month for collecting acorns, and for forwarding them safe and quickly. Does Dr. Falconer know if any of the Darjeeling oaks are growing in England? Some years ago I sent despatches of acorns from this to Lord Auckland and Dr. Wallich for transmission to England, and Dr. Wallich told me in January 1846, that the best mode of forwarding them was in boxes with earth; so as to allow of their germinating on the

voyage. I think this is very likely to be the best method, for I have never seen any acorns which were kept in the house during the winter germinate in the spring; those that lie in the ground all through the winter sprout in April and May. I also sent acorns from this to the Hon'ble Mr. C. H. Cameron, to be tried in Ceylon. He forwarded them by steam without any delay, and had them planted at once; but I never heard the result. Perhaps you can learn it from some one in Ceylon or Calcutta, who takes an interest in such matters, and had opportunities of knowing. Whatever may be considered the best mode of forwarding them to Europe, I may as well caution you of the extreme liability of the acorns of this place to be attacked by a small insect—a sort of weevil, and invisible to the naked eye. The oak trees and the wood are similarly susceptible. The former, while to all appearance in full health and vigour, are suddenly stricken and die. In all such cases that I have examined, the bark has been attacked by small insects, and converted into a yellowish mealy powder. The conversion of the bark into this state precedes and accompanies the decay of the trees. There is a fine tree close to my house which has died within the last year, and in the manner above described. Sometimes a branch only is attacked, which is marked by its dead black leaves, while the whole tree besides is in perfect foliage. The oak is, upon the whole, I think our best timber, but it is subject to the attacks of the weevil after it is felled, and while it remains exposed to the weather. I have not observed that it is at all attacked under cover."

Dr. Falconer observes as follows :—

"I have had the pleasure of receiving your note of the 4th, with the extract from Dr. Campbell's letter.

"I am not aware that any of the oak acorns sent by Dr. Campbell have been raised in England. I believe *Quercus lamellosa* is growing in the Royal Gardens at Kew, but probably not from Darjeeling seed. In fact, the acorns of the Himalayan oaks hardly ever reach England in a germinating state. This I found, by the experience of numerous trials, when at Saharunpoor. The embryo is thick and fleshy, with large juicy cotyledons, and a slight degree of desiccation is sufficient to destroy the vitality of the seed. In the Himalayas, the acorns ripen towards the end of the rains, and they drop from the trees, saturated with moisture, and with the germinating process already begun: you will rarely pick up an acorn on the ground if on grass or moss that has not already protruded the radicle of the germ. Sending seeds of this description home in a packet, however prepared, even by the overland route, is nearly hopeless. The only certain plan is to sow the acorns fresh in glazed cases, prepared to go to sea, and the chances are, that most of them will reach England in the condition of vigorous seedling plants.

"The insect to which Dr. Campbell refers as a weevil, infests, I suspect, most of the Himalayan oaks: worm-eating being excessively common in the acorns of those occurring on the N. W. Himalayas; and the timber, with the exception of one or two species, is very liable to dry-rot, or to decay, if at all exposed to moisture; or if used as beams, without seasoning.

"I shall most gladly receive any of the Cape acorns mentioned by you that you can spare; and I beg you will oblige me with them at your earliest convenience."

Communications on various subjects.

The following communications were also submitted :—

1. From B. H. Hodgson, Esq., communicating additional remarks regarding certain silk worms of the *Saul* forest, in reply to the observations of Mr. R. W. Frith on his former paper. Referred to the Committee of Papers.

2. From Baboo Tarrucknauth Roy, submitting a larger portion of his translation in Bengallee of “Fenwick’s Hand-book of Gardening.”

It was agreed to refer this translation for report to a committee consisting of Rajah Suttchurn Ghosaul, Baboos Ramgopaul Ghose and Peary Chund Mitter.

3. From K. M. Scott, Esq., mentioning the superior size and weight of peaches, the produce of his garden at Gowhatti, Assam :—

“I see that at the last Horticultural exhibition at Bhaugleapore, the peaches which carried off the prize were reckoned very fine, and that some of them weighed as much as 12 tolahs ! One morning about the end of last month (May) I had about 60 peaches from my garden, the four largest of which weighed together 83-12—the six next largest 104-8, and very few of them were under 12 and 14 tolahs. The circumference of the larger ones was from 9 to 10 $\frac{3}{4}$ inches. The heaviest I have weighed this season 22-4, but I have had scores weighing upwards of 19 and 20 tolahs.”

The Secretary was requested to apply to Dr. Scott for some grafts from these trees and as many stones as can be spared—also for a few details as to the stock from which they have been obtained, plan of treatment, &c.

4. From E. E. Woodcock, Esq., dated Beerbhoom, July 6. Mr. Woodcock states, that at the expence of a great deal of labor he has succeeded in making a garden of about a beegah of ground, with a good supply of water close at hand. “The garden,”—observes Mr. Woodcock—“is beautifully fenced in, and the Indian-corn you sent me a short time ago sown, and springing up luxuriantly. It is entirely at the disposal of the Horticultural Society for any purpose for which they may wish to make use of it, and on this account only it was made. I shall feel happy in being made the medium for carrying out any object in the horticultural line.”

Resolved,—That the best thanks of the Society be given to Mr. Woodcock for his liberal offer, and that supplies of Carolina seed paddy and any other useful descriptions of seeds be forwarded to him for cultivation, with a view to the distribution of the acclimated seed among the ryots in the vicinity of the station.

5. From Major T. E. A. Napleton, Honorary Secretary Branch A. and H. S. Bhaugleapore, intimating his intention of sending a quantity of acclimated vegetable seeds, the produce of their Branch garden. Major Napleton adds :—

“Regarding the oats and wheat sent out by the Court of Directors and forwarded to us by the Parent Society, I greatly regret to tell you that from all the reports I have received from this and the neighbouring districts, almost a complete failure has been the result of the crops.

“The wheat in all cases appears to have grown into a bush, and at reaping time to have thrown out a very few thin ears, of which I shall send you a sample with the acclimated seeds. Dr. Denham of Gya, Mr. Donzelle of

Toolseah Factory, and myself were a little more fortunate with the oats ; but generally speaking, they were a failure also. They grew most luxuriantly to the height of six feet but threw out very thin ears of corn. I attribute what little success attended my sowings to the circumstance of one of my cows getting loose one night and eating off the tops of the oat-stalks, and this check of their rapid growth is, in my opinion, the sole cause of these few stalks producing good oats."

6. From Messrs. Villet and Son, Cape of Good Hope, intimating that they are preparing the usual annual consignment of vegetable seeds, and that it may be expected the end of July.

7. From Mr. D. Landreth, Philadelphia, advising the despatch per *Washington Alston*, of a quantity of Indian-corn, and stating that the remainder of the consignment (vegetable and flower seeds) will be despatched from Boston in May.

8. From Messrs. Smith, Huffnagle and Co., announcing the arrival per *Leonore* of the consignment of Carolina seed paddy ordered by the Government of Bengal for trial on the Arracan coast.

9. From J. O. Price, Esq., Government Cotton Planter, Dacca, reporting unfavorably of the working qualities of a pair of Houldsworth's *churkas* forwarded to him last year by the Society.

10. From Messrs. Burn and Co., suggesting that the repairs to the Eastern porch of the Metcalfe Hall be delayed till after the rains, as the removal of the defective columns might be attended with considerable risk, if attempted during the present season, and enclosing a receipt for Rs. 511-15 6, in advance, being one-half the amount in terms of their estimate already submitted. Messrs. Burn and Co. conceive that "the Committee of Management cannot object to pay this advance, as the expence of the teak timber for the security of the porch was paid for by them 12 months ago."

After a brief discussion it was ordered, that the advance be made.

The minutes of the Committee of Papers, to whom were referred for report, an application from Mr. Speede, soliciting from the Society "some degree of encouragement and patronage" to aid him in carrying through the press an abridgement in Bengalee of his "New Indian Gardener,"—were likewise submitted. The members offer several suggestions with the view of making the proposed work more generally useful to the native gardener, and close their remarks by recommending its encouragement by the Society, "on the express ground of its being the *first attempt* to furnish a work on gardening in the vernacular of Bengal irrespective altogether of its merits" ; and they are further of opinion, that the best mode of encouragement would be to take a certain number of copies, the same being regulated by the price of the work.

Resolved,—That the substance of these minutes be communicated to Mr. Speede, and his particular attention directed to the recommendations contained therein. That on the completion of the work it be again submitted to the Committee, and the extent of patronage governed ultimately by such report as they may make on it.

(Thursday, 10th August, 1848.)

Dr. Charles Huffnagle, Vice-President, in the chair.

Elections.

Major General Sir W. R. Gilbert, K.C.B., Messrs. G. Hewett, R. Spooner, A. H. Matthews, Captain Champneys and Cornet Crabtree.

Proposals.

R. Ince, Esq., Chittagong,—proposed by Mr. A. Sconce, seconded by Mr. F. Skipwith ;

William Thomson, Esq., (firm of Messrs. Malcom and Co.)—proposed by Mr. W. Hammill, seconded by Mr. S. P. Griffiths ;

Robert Stopford, Esq.,—proposed by Mr. W. G. Rose, seconded by Dr. Huffnagle ;

Baboo Rajendur Dutt, Calcutta,—proposed by Baboo Pearychund Mittra, seconded by Rajah Pratab Chunder Sing.

Baboo Ramapersaud Roy, Bahadoor, Calcutta,—proposed by Mr. W. Anderson, seconded by Baboo P. C. Mittra.

Presentations to Garden and Museum.

1. A large supply of teak seed from the Tenasserim provinces. *Presented by Captain Latter.*

2. Seventy-five seers of *Julalya* wheat from the Nerbudda. *Presented by Lieut.-Col. Ouseley.*

In his communication, advising the despatch of this wheat, Col. Ouseley mentions that he has sent 50 seers of it to Sir H. Willock, and 25 seers of the *Pissee* wheat, as he is anxious to know what the opinion of English farmers may be regarding the produce of the Nerbudda valley. Col. Ouseley hopes some one may take a fancy to this *Julalya* wheat at or near Calcutta, as he thinks the alluvial soil of Bengal, if not in too damp a situation, would answer particularly well.

3. A fine supply of acclimated vegetable seeds, the produce of the Bhauglepore branch garden, consisting of cauliflower, artichoke, beet, lettuce, turnip and carrot. *Presented by Major Napleton, on behalf of the Branch Society at Bhauglepore.*

4. An assortment of acclimated vegetable and flower seeds, the produce of the Lucknow branch garden ; also specimens of wheat, barley and oats raised from the seed forwarded last year to the Parent Society by the Court of Directors. *Presented by Captain Hollings.*

These specimens are very superior to the bundle of wheat received from Major Napleton, raised from the same batch of seed ; but, as stated by Major Napleton, in his letter inserted in the last month's proceedings, the result of the trials in the Bhauglepore and neighbouring districts, was a complete failure as regards the produce, though the seeds germinated readily.

5. A large assortment of American maize of sorts, and a few maunds of cotton seed of three kinds, viz., "Protective," "Parent," and a cross on Sea Island. *Forwarded at the Society's request, by Mr. Landreth, Seedsman at Philadelphia.*

6. An assortment of Cape bulbs. *Purchased by the Society.*

The Secretary stated, that a portion of these had been forwarded to the Lucknow and Bhauglepure gardens, and a few of each to the Society's garden.

7. A further supply of vine cuttings. *Presented by W. Stalkart, Esq.*

8. A small quantity of English vegetable and flower seeds, forwarded by Dr. Royle from the India House, and received by the last steamer.

9. Specimens of cotton and twist, the produce of the Lucknow garden. *Presented by Captain Hollings.*

In his notes intimating the despatch of this cotton, and the seeds above mentioned, Captain Hollings gives a few details about the garden under his charge. "We have had"—he observes—"a great show of flowers this year; on my return I found specimens of almost all the kinds exhibited in Calcutta, when I was there, in great perfection; the *phloxes* were very handsome, and of all kinds. We have not been able to preserve any old plants of heart's-ease, although we have not lost a single one of violets; the season has been trying for geraniums, but those in the garden are alive. All the flowering shrubs are in excellent order. I can give seed of the *Sumach* and cuttings of the *Morus multicaulis* to any one who requires them, also in the season, cuttings of tapioca. We have had a bad fruit season, the blossom was blighted by rain and strong easterly winds, and a large portion of the fruit blown off by storms before it was ripe,—and the most unfavorable weather lately (7th July) has completed the destruction of our crops. We have had no regular rains yet, and are suffering much from want of them; the hot winds burn up the trees."

The minutes of the members of the Grain and Finance Committees, to whose consideration was referred the communication from Dr. Campbell read at the last meeting, suggesting a project for the liberal interchange of agricultural seeds between the various districts of India, were submitted to the meeting. The members concur generally in the impracticability of the measure proposed by Dr. Campbell, and some of them in its inexpediency.

Resolved,—That the substance of these minutes be communicated to Dr. Campbell.

Read the following letter from Lieut.-Col. Ouseley, acknowledging the award to him by the Society of a gold medal, in terms of the motion, carried at the last general meeting:—

JAMES HUME, Esq., *Hon. Secy. A. and H. Society.*

SIR, The distinguished honor conferred upon me, by the Agricultural and Horticultural Society of India, as intimated to me in your letter of the 17th inst., I shall ever feel the greatest pride in, at the same time I experience the most grateful feelings for the high consideration afforded my endeavours to promote the welfare of the charge entrusted to me, by the Society.

It is entirely attributable to the opportunities I have enjoyed of laboring in such extensive and valuable tracts of country, hitherto little known, the capabilities of which, must, I hope, soon be developed.

To you in particular, I am much indebted, in having from the first, and on all occasions, so kindly brought to the notice of the Society the very

important subject of the wheats, linseed, &c. of the Nerbudda, and the coffee now I hope safely introduced into Chota Nagpore.

Chota Nagpore, July 22nd, 1848.

I have, &c.,
J. R. OUSELEY.

A communication from Dr. Falconer, submitting a letter to his address from Major Williams, Senior Assistant Commissioner of Arracan, regarding a monstrous specimen of the jack fruit was next read:—

"I have the pleasure to send you a communication from Major Williams, Political Agent, Kyook Phyoo, dated the 24th July, respecting a monstrous kind of jack fruit, which weighed upwards of 63 lbs., and measured 4 feet 1½ inches by 4 feet 8 inches. This prodigy of a jack grows at Tulak, a village in the province of Kyook Phyoo, and is called "Paton Piennaithee," from its size.

"Major Williams put up some of the germinating seed in a small open box: but no particular care appears to have been taken of them on board the steamer, and on reaching the Botanic Garden, they were all found to have moulded or damped off, except one. This result is very much to be regretted, but I hope to be able to procure some plants from Mr. Thurburn, Major Williams' temporary successor, during his absence on sick leave to the Cape.

"An thing approaching 63 lbs. is a prodigious size for a jack fruit. It is considered large by the natives of Bongal when it attains 30 lbs. I retain the solitary surviving seed for the Botanic Garden.

"It may be of interest to the society to learn in connection with the subject of the jack fruit (*Artocarpus integrifolia*) that the bread fruit tree (*Artocarpus incisa*) has this year fruited in the Botanic Garden. The seeds have ripened, although the fruit was comparatively small. The tree was grown under dense shade by Dr. Wallich, in consequence of its having been found to die down annually to the bottom of the stem when grown exposed. It has now attained a goodly size, being about 30 feet high, but has drawn up slender, with a clean naked stem, in consequence of having been grown in shade. Its crown has now risen above the mangoe trees which covered it. I think the circumstance deserving a record, as Dr. Wallich in his official report, dated December 1840, states that the bread fruit and *Cheromolia* had never fruited in the Botanic Garden up to that time. It is of the seed-bearing kind, which is not so much esteemed as the seedless sort of the South Sea Islands."

Botanic Garden, 6th August.

"MY DEAR SIR,—I have just had brought in to me the largest jack fruit I ever saw, or that ever has been seen. It grows at Tulak, a village in this province, and one tree amongst many others only bears the monster fruit. Many years ago one of them was presented to the late Mr. Charles Paton, formerly Commissioner of Arracan, and from its gigantic size was named, and is so named by the Mugs to this day, the "Paton Piennaithee," or Paton jack fruit. Mr. Paton was a very large man.

It measured round 4 feet 1½ inches, and round longitudinally 4 feet 8 inches, and weighed 31½ scers.

The weight and dimensions are less than they should be, as a large piece of the fruit was cut off before it was brought to me.

I request the favor of your sending some of the seeds which I send you to Mr. Hume, the Secretary Horticultural Society and this communication.

Kyouk Phydd, July 24th, 1848.

D. WILLIAMS."

"In a work I have, it is said that this fruit grows to the weight of 30 lbs. ; this fruit weighs 63 lbs., and not a whole one :—all the seeds have vegetated within the fruit !—and I am obliged to plant them at once, and will send them to you by Captain Dicey of the steamer."

In reference to Dr. Falconer's remark regarding the fruiting of the *Artocarpus incisa* in the Botanic Garden, the Secretary intimated, that the Society had two very healthy individuals of this tree in its garden, raised from a few roots received from Egypt through the kindness of Dr. Huffleagle.

Communications on various subjects.

1. From G. A. Bushby, Esq., Secretary to the Government of India, transmitting for the information of the Society, copy of a memorandum by Dr. Royle, on the subject of the failure of the agricultural seeds last forwarded by the Court of Directors, and stating that the suggestion of Dr. Royle for the despatch of further supplies, according to the mode proposed by him, has met the approval of the Court. Referred to the Committee of Papers.

2. From Major Napleton, Hony. Secy. Branch A. and H. Society, Bhaugle-pore, offering his acknowledgments for the fine supply of Carolina paddy, white linseed, tobacco and other seeds sent him in July.

3. From Mr. D. Landreth, Philadelphia, dated May 23rd, advising the shipment of the Society's order of vegetable and flower seeds.

4. From J. G. Bruce, Esq., Deputy Collector, Cawnpore, enclosing a letter addressed by him to the Commissioner of Revenue, Allahabad, on the subject of indigenous cotton, and requesting its publication in the Society's Journal. Mr. Bruce also requests the Society to procure for him 125 maunds of good American cotton seed, for which he will be happy to remit the amount.

The above letter and its enclosure were referred to the Committee of Papers. In reference to the application for cotton seed, it was agreed to place a portion of the stock just received from the United States at Mr. Bruce's disposal, and the Secretary was further requested to communicate to that gentleman in what manner his desire for the large supply required for next year's experiments could best be met.

Before the members separated, the Secretary drew their attention to a cotton-cleaning machine on the *churka* principle, received since the last monthly meeting, which had been forwarded by Mr. Burn of Edinburgh, to compete for the Society's prize. The rainy season being an unpropitious time for testing the working powers of a *churka*, it being necessary to expose the *kuppas* for several hours to the sun previous to passing it through the rollers, it was agreed to defer the trial of this, and any other machines that should be sent in for competition, till the cold season.

Correspondence and Selections.

REPORT OF AN EXHIBITION OF VEGETABLES, FRUITS, AND FLOWERS, HELD AT BHAUGLEPORE, ON 27TH NOVEMBER, 1848.

(Communicated by Major T. E. A. NAPLETON, *Honorary Secretary Branch Agri-Horti. and Floricultural Society.*)

The first horticultural exhibition of the season took place in the Society's show-rooms, in the public gardens, on Monday, the 27th of November 1848, at 4 o'clock.

The attendance of European and Native gentlemen was great, and every one who honored the show with their presence seemed to take a lively interest in the proceedings of the evening.

The show of vegetables was not so fine as it has been on former occasions at this season of the year, but the circumstance of three days heavy rain, accompanied by a severe gale of wind having visited us at a season when we least expected it, viz. from the 14th to the 16th of October, will easily account for our first crops having been destroyed, and our second ones being unusually late.

The following baskets of vegetables were to be seen on the show-tables, the produce of our Society's gardens :

Peas, cauliflower, beet-root, new potatoes from Bombay seed, asparagus, turnips, carrots, Tenasserim yams, onions, French beans, love-apples (2 varieties), lettuce, endive, scarlet radishes, cabbage, plantains, brinjals, Caubool capsicums, Nepaul chillies, spinach, parsley, herbs, West India arrow-root tubers.

The following gentlemen were kind enough to do the duty of umpires: Mr. Cathcart, Mr. Alexander, Mr. Loch, and Muharaja Jyemungul Sing, and having inspected the *dalees* from our Society's gardens, pronounced every thing to be excellent, and highly creditable to the institution.

From private gardens there were an immense number of *dalees* brought for competition, and the umpires awarded prizes as follows :

To the gardener of W. S. Alexander, Esq., the sum of 5 rupees and 12 annas, for a bouquet of roses, a basket of peas, and for the best cabbage, French beans, radish, and chillies.

To the gardener of G. F. Brown, Esq., 1 rupee and 8 annas, for a bouquet of roses and a *dalee* of cabbages.

To the gardener of R. N. Shore, Esq., the sum of 3 rupees, for the best specimens of double *Zinnias*, radish, capsicums, and West India arrow-root.

To the gardener of P. Onraet, Esq., the sum of 2 rupees, for five superb yellow *dahlias*.

To the gardener of Captain Den, 2 rupees, for lettuce, cauliflower, and Jerusalem artichokes.

To the gardener of J. Glas, Esq., the sum of 4 rupees, for a bouquet of beautiful double pink *Chrysanthemums*, which, from their circular shape, general fulness, and pretty color, were mistaken for double daisies ; also for double white China rose, West India arrow-root tubers, and Tenasserim yams.

To the gardener of J. Piron, Esq., 1 rupee, for the best basket of beet-root.

To the Cleveland house gardener, the sum of 11 rupees & 12 annas, for the best bouquet of roses (9 varieties), *dahlias*, sweet brier, *Durantas* (3 varieties), also for the best *dalee* of peas, new potatoes from Bombay seed, carrots, onions, Jerusalem artichokes, and nohl-kohl.

To the gardener of W. H. Brodhurst, Esq., 1 rupee and 8 annas, for a bouquet of *Gaillardia picta*, turnips and onions.

To the gardener of G. H. Grant, Esq., the sum of 2 rupees, for cauliflowers and beet-root.

To the gardener of R. C. Raikes, Esq., 14 annas, for a bouquet of *Gaillardia picta*, and a basket of turmeric.

To the gardener of Mudhun Tackoor, Zumeendar, Kulan, 2 rupees and 12 annas, for new potatoes and the best *dalee* of indigenous vegetables of all sorts.

To the gardener of Baboo Gooroo Churn Mitter, 2 rupees and 12 annas, for the best yams, herbs, and 2nd best *dalee* of indigenous vegetables of all sorts.

To the gardener of J. Pontet, Esq., 2 rupees and 8 annas, for nohl-kohl, turmeric and water-cress.

To the gardener of Quarter-Master Serjeant, Dowling, 2 rupees and 8 annas, for turnips, French beans and Cabool capicums.

To the gardener of Moulvee Ubdollah Khan, 12 annas, for the 3rd best *dalee* of indigenous vegetables of all sorts.

To the gardener of Moulvee Mahomed Rafiq Khan, 8 annas, for yams.

The following is a list of money and other donations since our last show in May, 1848.

From Melmoth Hall, Esq., Lehra, Goruckpore, the sum of Company's rupees two hundred on the following accounts: 64 rupees as a present or money donation on joining the Society as a subscriber—18 rupees on account of one year's subscription in advance, from the 1st of October, 1848—50 rupees as a money prize for the agriculturist or individual who shall bring to our next May grain-show five seers of unmixed white wheat. The wheat to be *Dooda* or any other white wheat, grown in the Bhauglepore or neighbouring districts. Jubbulpore, Kutmandoo, English or Scotch, &c. &c. to be considered foreign wheats, and not to be allowed to compete for the prize. Also the sum of 50 Rupees to the individual who shall bring to the same show five seers of the finest unmixed red wheat: all wheats, except those usually grown in the Bhauglepore or neighbouring districts, to be considered foreign wheats.

Also 18 rupees in payment of one dozen bottles of arrow-root, prepared in the Society's garden, from the finest West India tubers.

A donation of 25 rupees from a gentleman from Calcutta who visited our public garden in October, 1848.

The Honorable Sir L. Peel's annual subscription of one hundred rupees.

From Captain Swinton, 32nd N. I., 4 packet of pine seeds from the Himalayas.

From J. F. Cathcart, Esq., Civil Service, two orchideous plants belonging to the genus *Vanda*, natives of the Terai, with a painting of their beautiful flowers: also from the same gentleman, a money donation of one hundred rupees.

From Colonel Ouseley, Governor General's Agent, Chota Nagpore, three hundred coffee and fifty tea plants, also a fine supply of tea seeds.

From the Parent Society, two silver medals and fifty rupees, their accustomed annual gift, also a box of English cereal grains,* a fine supply of French beans, peas, white linseed, some vegetable seeds, also a splendid assortment of bulbs of rare Cape plants.

This opportunity is taken of making mention of the cereal grains having nearly all germinated very well, and the crops have now a most healthy appearance.

Most of the Cape bulbs have come up, and are looking very healthy; also a donation from the Parent Society of a splendid plant of the beautiful *Poivreia coccinea*, one *Cordia Sebestena*, and several other beautiful flowering plants from their new and flourishing garden.

From G. Wood, Esq., of Calcutta, a fine plant of *Ixora Japonica*.

From J. Piron, Esq., a plant of worm-wood:

From L. Manly, Esq., of Calcutta, several rare *Pelargoniums*, *Arums*, *Lagerstromæas*, *Euphorbia jacquiniiflora*, *Begonia*, *Duc de Berri rose*, *Rosa Manlyana*, &c. &c.

From Dr. Falconer, Superintendent H. C. B. Gardens, a good supply of flower seeds and some English vegetable seeds.

From R. Lowther, Esq., Civil Service, some plants of the *Aristolochia indica*, some seed of double stock, lupins, wallflowers, &c. &c.

From Captain White, commander of the *Lord William Bentinck* Steamer, two bottles of lucerne seed.

From G. Drummond, Esq., Peergunge, Purneah, a large packet of English flower seeds.

From Captain Hamilton, commander of the Steamer *Indus*, a packet of Assam tea seed.

From Muddun Tackoor, Zumeendar, Kulan, Zillah Bhauglepor, a fine supply of Prussian-blue and marrow-fat peas.

From C. Smith, Esq., Civil Service, three packets of seeds of plants indigenous to the Cossyah Hills.

From W. S. Alexander, Esq., Civil Service, a bottle of *Ipomæa rubro-cærulea* seed.

* These grains were received by the Parent Society from the India House in October.—EDS.

From Muharaja Jyemungul Sing, the sum of twenty rupees, which he requested the Honorary Secretary to give as presents to the *mallees* of the public garden.

From Moulvee Reasut Ullee, Sheristadar Dewanee Adawlut, Mozufpurpore, the sum of twelve rupees, as a donation on joining our Branch Society.

List of New Subscribers since the last show.

G. C. Sutherland, Esq., Captain S. R. Tickell, C. A. Shillingford, Esq., H. C. Cave, Esq., J. Brandt, Esq., Robert Dowcett, Esq., R. S. Cohen, Esq., Charles Tucker, Esq., Robert Neave, Esq., B. Sapte, Esq., Robert J. Richardson, Esq., George Loch, Esq., A. R. Smith, Esq., Muharaja Chutturdharee Sahee Bahadoor, Dewan Nassir Ullee, A. Ogilvie, Esq., Samuel Smith, Esq., Raboo Keerut Sing, R. O. Haywood, Esq., Shaikh Deedar Ullee, Melmoth Hall, Esq., J. J. Ward, Esq., W. H. Smoult, Esq., Moulvee Reasut Ullee.

In the floricultural department were to be seen, from the Society's Garden, many beautiful bouquets.

The *Banisteria laurifolia*, *Oxalis*, many varieties of the *Passifloræ*, a real Forget-me-not, Geraniums, roses (10 varieties), double pinks, double *Zinnias*, *Durantas* (4 varieties), *Ipomæas* in great variety, *cum multis aliis*, were in lovely blossom. The undermentioned ladies most obligingly tested the specimens of flowers brought for competition, and awarded a great many prizes: Mrs. Alexander, Mrs. Trotter, Mrs. Diaper, and Mrs. Shore.

There was a vast improvement in the bouquets brought from private gardens on this occasion, which is a clear indication of the pains bestowed by the members of our Branch Society on the floricultural department of their respective gardens.

The Native gentlemen too, of this and the neighbouring districts, have of late imbibed a great taste for gardening in all its branches, and thousands of flower plants and fruit-grafts have been sent them.

Extract of Report on the Teak Forests in the Tenasserim Provinces.
To J. R. COLVIN, Esq., Commissioner, T. P.

Dated Maulmain : 17th May, 1848.

Para. 2. I crossed the Kokareet Pass over the Donaw range, in the beginning of December last, and proceeded in a NE. direction to the Thoungyeen river, through the villages of Laydau and Meiplai. From thence I proceeded down the river, along its banks, to Thiopau's village, south of the Kamoklah hills. From thence I started southward towards the sources of the river, and endeavoured to keep as much as possible in the centre of the forests; having the Thoungyeen river about five miles on my left, and the Donaw range about the same distance on my right. Proceeding thus, I crossed the Meiplai river, and striking the road leading to the old town of Mierawaddy, I went along it half a day's journey, and reached the bank of the Thoungyeen a little above the ruins of the old city.

3. At this spot I crossed the river to the Shan side, wishing to see the forests in that territory, and the actual effects of the mode of working them. Along the Shan bank of the river, I proceeded till I arrived opposite Papho's village, a little below the junction of the Meglar and Thoungyeen. I here re-crossed to the British side and marched up as far as I could towards the sources of the Thoungyeen, keeping the river a few miles on my left, until I struck it some distance above the junction of the Gauley and Paupee Khyoungs.* At the junction of these two streams the Thoungyeen loses its name, the main stream taking the name of the Gauley Kyoung.

4. I had thus gone through two-thirds of the forest by land, keeping as much as I could in the central tracts, penetrating further than any European before, and reaching a spot seldom visited even by natives. I determined on my return to inspect the forests in their whole river face; for which purpose I had a raft made at the junction of the Gauley and Paupee Khyoungs, and proceeded with great difficulty as far as Papho's village, just below the junction of the Meglar and Thoungyeen. Here making a more commodious raft, I floated down through the whole length of the stream, laying down the various streams, and the direction of the river; landing to make inspections whenever necessary, and passing through the 'precipitous' gorges of the *Kyoukhet*, and *Kamoklah* spurs; until I arrived at the mouth of Wiensaw Khyoung, below which the forests were very insignificant. Although I had thus inspected the whole river face of the forest tract, there was still a locality the central portion of which I had not visited by land, viz. from the north face of the Kamoklah spur to Wiensaw Khyoung, including the land occupied by the villages of Wiensaw, Powatsau, and Gnathanyo. Accordingly, leaving the village of Wiensaw. I

* Khyoung, "a small stream."

retraced my steps towards the south, keeping the river about 6 miles on my left, until I reached Gnathanyo's village; whence I returned by the same route to Wiensaw village and crossed "*en route*" to Maulnain by the Donaw Pass.

5. It will thus be perceived that my route lay through the whole length of the forests, midway between the Thoungyeen and the Donaw range, both by land as well as along the river face.

6. The region occupied by the Thoungyeen forests consists of an elevated valley, (about 800 feet higher than the Maulmain plains,) having the Donaw range on the west, and the range called the "Toungnyo," on the east. These two ranges, slightly trending towards one another, meet, and form a sort of "*cul de sac*" at the bottom of which rises, and through the whole length of which, in a north-westerly direction, flows the Thoungyeen river. It runs parallel to the Donaw range, which sinks gradually into the plains to admit of its junction with the Salween river. The Toungnyo range, as far as I could learn, runs due N., proceeding into regions unreachd by our geography. I should estimate the whole length of this valley to be about 250 miles; its width, an average of 25 to 30. The Thoungyeen, keeping somewhat closer to the Donaw range than to the Toungnyo, divides the valley into two long strips. The one on the left or western bank being held as British, may average about 12 miles in width; the other, or Shan, about 15 or 18.

7. This valley is happily and conveniently divided into three parts by two mountain spurs; the southernmost being called the "*K'youkhet*," or "Rocks of Difficulty;" the northernmost "*K'amoklah*," or "The Ruler's Rock," from a Talien prince and his suite having been wrecked and drowned there. Thus the valley may be considered as consisting of three portions. The highest and southernmost, from the sources of the Thoungyeen to the Kyoukhet spur, may be called the "Upper Thoungyeen." The next and largest portion, between Kyoukhet and Kamoklah may be called the "Central Thoungyeen," and from Kamoklah downwards, the "Lower Thoungyeen."

8. Both the bounding ranges of Donaw and Toungnyo, together with their spurs, consist of mountain limestone, presenting all the grey and grotesque appearances and cavernous issues of sudden waters (many at a high temperature) so characteristic of that rock. Their highest portions again are of granite, but of a composition in which the felspar greatly predominates; the quartz and mica being in very subordinate quantities. It is for this reason the weathered peaks get very rapidly disintegrated, the felspar rapidly decomposing into Kaolin clay; the fracture of such points presents the dead even appearance of a clay rock, rather than the sharp and angular edges of true granite.

9. It is from the disintegrated felspar of these weathered peaks that were probably, in a great measure, once supplied the deposits of stiff clay, which

we find playing so important a part in the economy of the Thoungyeen forests. These ranges are also said to be metalliferous.

10. Though the two narrow strips into which the valley of the Thoungyeen is divided by the river, belong to the same region of land, yet in their minor features they present a curious difference of physical aspect. The first thing that drew my attention was the circumstance, that, in proceeding down the Thoungyeen, whilst the British bank presented an innumerable succession of small streams and rivulets, most of them dry in the cold weather; the Shan side showed few or none of such, the mouths of large streams only presenting themselves, and in most cases these were dry. Whereas the only large stream of equal size on the British side (the Meiplai) was full of water. This is caused by the fact that whilst the central portion of the British forest-strip consists of a considerably raised plateau or ridge, the corresponding portion of the Shan side is depressed; thus all the water on that side is shed inwards into the depressed central portion, and when the level of this water gets above the mouth of the evacuating streams, the water flows into the Thoungyeen. When, however, it is lower, this central region forms marshy rice-land. Whereas on the British side, the central portion being raised, (as is well shown by an inspection of the map of the Central Thoungyeen) there is one mass of water shed directly into the Thoungyeen, another towards the Donaw range, which, with the drainage of those hills, forms the Mekanai Khyoung, the Lamma Kyoung, the Meiplai Khyoung, running north and south, till they meet and proceed in one channel eastward into the Thoungyeen, under the common name of Meiplai River.

11. This difference in the physical geography of the two tracts affects their respective forests in a remarkable manner. For, as on the Shan side, the forests only occupy the more elevated banks of the river, and the region along the base of the Tounngnyo hills, there is left the low central portion for rice-land, by which (though unadapted for teak) a considerable population may be supported without trenching on the forests; and there exist consequently a great deal of *Lay* "wet, or permanent cultivation" there. Whereas an opposite state of things existing on the British side, and there being no large central tract adapted for permanent cultivation, (but only a raised plateau on which teak will not grow) the small number of inhabitants it can support are obliged to clear tracts of forest for the purpose of raising their crops of grain. Their cultivation, though on a plain, is therefore called *Toungya* "hill, or shifting cultivation."* It will be shown that these

* Before the occupation of these provinces by the Burmese, the valley of the Thoungyeen was divided into four countries or jurisdictions, extending from the Donaw to the Tounngnyo range, and supported a considerable Talien population. The chief cities, the ruins of which may still be traced were *Micawadie*, *Dongmwey* (now Wiensaw), *Donggyeen* (now Ekalaik), and *Dong-Thoungyeen*. These were all situated on the now British bank of the Thoungyeen, whilst their rice cultivation lay on the other side of the river, now possessed by the Shans subject to Siam.

continued and continuous clearances of forest ground have a very disturbing effect on the forest vegetation.

12. A thorough appreciation of these forests cannot be given without a few remarks on their geological structure. The features of these are simple, but striking.

13. The great underlying rock is most probably the mountain limestone, of which the Donaw and Toungnyo hills are composed; but in the valley itself this nowhere obtrudes itself to view. We find there the lowermost rock to be a compact sandstone, the upper portion consisting of a coherent of small rolled pebbles imbedded in a silicious matrix. On this reposes a deposit of large rolled pebbles, the depth of the bed varying from 8 to 14 feet. On this again, and of about the same thickness is a bed of stiff pure clay, supporting a layer of "humus" or soil proper, of from a few inches to a foot in thickness.

FIGURE 1.—These strata are generally quite horizontal, except in the upper Thougnyen, where the sandstone has a dip of about 35 degrees.

14. It will be observed, that the newest deposit of the above is the stiff clay. It is this rock that the teak tree affects most particularly, and in proportion to its presence and thickness is the abundant growth of the tree.* The superficial deposit of "humus," or "soil proper," composed of the decay of vegetable matter, is not favorable to forest vegetation. It is evident, therefore, that whatever local causes affect the presence or distribution of these two beds, have a corresponding effect upon the nature of the vegetation that clothes them. One great disturbing cause is the washings or removals of surface caused by the heavy tropical rains. In a long sweep of country, such as the Thougnyen forests, there are undulations and depressions of surface. Into the lowest of these the superficial soil is washed, is retained, and accumulates; and we find one sort of vegetation. In places of an intermediate depression, where the influence of the soil predominates, but is yet mixed with a large quantity of clay, we find a second kind of vegetation. Till coming to the pure unmitigated clay itself, we find the forest reigning in all its grandeur.

15. We find these three stages of vegetation peculiarly marked. First comes the real forest, free from underwood, with its stately avenues and um-

* This is the general rule, there may be occasional exceptions, which however will be found due to local peculiarities. A stunted teak for instance is sometimes found on the very summit of perpendicular cliffs many hundred feet in height, as also on the precipitous sides of a hill; but then these are always composed of limestone, which, from its tendency to abound with cavities and irregular shelvings, enables clay and moisture to lodge. Again, teak is very often found abundant on low hills, but these hills will be found composed almost entirely of clay, as may be shown by the circumstance of elephants sinking deeply into the ground in mounting over them during the rains, as also from the excessive slipperiness of the soil. All this mark a teak soil. Whereas the portions occupied by fir and Engbeng are not at all softened by the heaviest rains, and receive no impression from the weightiest tread.

brageous trees, shading its dank and unripened bosom from the genial influences of the sun. Next and intermediate, are found growths of smaller, and as it were, more orchard-looking trees, such as the papaya, the wild sloc, and many wild fruit trees; as also the coarse tall tiger-grass, the scrub bamboo, &c. &c. The soil here, more accessible to the ripening effects of the atmosphere, has progressed a stage towards maturity. Last we find occasional sweeps of soft Savannah grass, the presence of which is a sure sign that the soil has fulfilled the full circle of its obligations towards the production of a cereal crop. Where such tracts sufficiently abound they are used for *laydén*, the "wet" or permanent forest cultivation. It will be perceived that the forest, depositing an endless succession of decaying vegetable matter, (which accumulates and forms "humus," or soil proper,) would, as it were, ultimately cause itself gradually to disappear, were it not that the disturbing and removing causes above alluded to, put off this catastrophe to an almost indefinite period. I consider these remarks of importance, as they should be borne in mind in the selection of localities for artificial nurseries. It also explains the reason why teak is found to be the most abundant in the vicinity of streams. It is a very great mistake to infer from that circumstance that the teak tree affects a damp soil; it is, on the contrary, a peculiarly dry and arid looking plant. Any attempt at planting it along the low banks of plashy streams would meet with failure.

16. Although the process, which I have described above, is that of nature, yet it can be hastened by the hand of man. By far the greatest cause of the destruction and disappearance of the teak tree is the cutting down and clearing the forest for the purpose of cultivation, or *Toungyas*. Although all the individual teak trees may be left standing, (as they generally are), yet the soil having been once exposed to the influences of the sun and atmosphere, the vegetation that re-appears is never of the original or forest kind, but of the intermediate or second stage. All the forests in the lower Thoungyen, from the northern flank of the Kamoklah spur downwards, are gradually disappearing on this account. I have passed for days, through these deserted *Toungyas*, deserted long before the memory of man, and have never seen them reverting to their original type. Not but what, in the lapse of ages, the words of the Latin poet might not be applied to them,

"Magnus ab integro seculorum nascitur ordo."

17. In illustration of the above, I will here submit for your inspection, a section of the forests, from the Thoungyen river to the Donaw range.

FIGURE 2.—The section is that of the tract, about 3 miles south of the Meiplai, running due east and west, and at right angles to the course of the Thoungyen river, where the characteristics, which I have endeavoured to insist upon, are the most marked. This section shows very prominently the raised central sandstone plateau alluded to in para. 10, as inimical to the

presence of teak, simply because the clay has been washed off of it to the lower and more level land near the rivers. It is on this spot that are found the fir and Engbeng trees. This last is a tall straight tree, something like teak, with a white, light, stiff wood, and from what was said by a nautical person, who was for a short time in company with me, appears well adapted for spars and masts. In the districts immediately above and below the Meiplai district, to which the above section refers, this central plateau is conformably represented by a range of minor but precipitous hills, running more or less parallel to the Thoungyeen river and the Donaw mountains.

18. But if instead of taking a vertical section of the forests in their breadth as above, we take one in their length, we find the identically same peculiarities, though on a smaller scale. For instance, the one below is a section running N. and S. parallel to the course of the Thoungyeen river, of the tract of country called Thiepau's, south of the Kamoklah spur, and north of the Meiplai. I have chosen it, because it abounds in a greater number of little streams.

FIGURE 3. —A. Raised plateau of sandstone, without teak, also not elevated enough for fir, but covered with Engbeng.

B. Clay (resting on the bed of rolled pebbles) washed to the vicinity of the streams and covered with teak.

1. Maupoothoo Khyoung, (stream.)

2. Thiekara do. do.

3. Thongan do. do.

4. Engyeen do. do.

It is thus evident, that if a person were walking over such an extent of country, he would find himself in a forest of Engbeng trees, then he would fall in with teak, and would know from its presence that he was in the vicinity of a stream, crossing which he would again find teak; then he would get among Engbeng trees again, and so on.

19. A superficial observer, therefore, thinks that this connection between teak and streams is on account of the presence of water, and that the plant affects a damp soil; whereas such is not the case. The reason being that in those localities, the stiff clay has been washed down and is enabled to lodge.

20. Having thus, at some length, given a description of the physical aspect, and geological structure of the Thoungyeen forests, before proceeding to the next portion of my subject, I will make one remark, to which I shall have to refer hereafter, and that is, that when the clay, the presence of which is so necessary to the existence of teak, is largely mixed with lime, the compound thus formed, being the most favorable for the development of vegetation, we find in those districts through which the limestone spurs of Kamoklah and Kyoukhet have obtruded themselves, (the disruption of strata so created having caused their lime to mix with the clay,) that the teak, although

perhaps, not quite so numerous, is yet individually of a far more magnificent and universally vigorous growth, some being full 18 cubits in girth. There are also very few if any trees of imperfect development.

21. Having thus mentioned the kind of soil on which teak grows, I will proceed to make a few remarks on the nature of its growth, and the mode of its propagation. Teak is never found in a forest entirely composed of individuals of its own kind, but in company with numerous other forest trees, all requiring the same contingencies of soil and circumstance, and having the same peculiarities of growth. Sometimes a patch of 30 or 40 young teak trees may be seen without almost any intermixture of other trees; but this is only in particular cases round some tree which is shedding its seed. Teak may be said to be very numerous, when it averages one in eight of the trees of the forest. It is thus evident that all the teak in a tract may be cleared away, without in any way altering the forest aspect of remaining vegetation.* The individuals of other families that remain, still enable the ground to keep up its original type. Therefore, if young teak were planted on such spots, all the contingencies would exist necessary for their progress to maturity. Whereas, if the ground had been thoroughly cleared, as in the case of Toungyas, the soil, having become altered, could only afford the requisites for a totally different species of vegetation.

22. The grand mode by which teak propagates itself is by seed. I have never seen a single case of a sapling shooting from the root; and in the Thoungyeen, only in a few cases, where the soil was adapted for a vigorous vegetation, have I seen the stump that had been left of a felled trunk, sending up shoots. The first spot on which I saw young teak in any abundance, was half a day's march beyond the Meiplai village; and after a careful examination of the locality, I found that they were evidently from the seeds of some partially decayed trees which had been left standing; and in every other case in which I met with young teak, I found that their presence could only be attributed to a similar cause. This is a very singular fact, but it is almost more singular how it explains many points, which appeared so difficult of solution, in reference to the self-propagation of teak. It is a remarkable circumstance that whenever I found a great number of fine vigorous and sound full-grown teak trees, I never saw any seedlings near them. But where these fine sound trees had been cleared away, and here

* This observation is worthy of remark, as it shows that if young teak do not re-appear in the same localities from which wood-cutters have worked out the original teak, it is not because the ground or soil is altered. In such spots, viz., forests where the teak tree only has been cleared away, and all the other forest trees left, the place of the removed teak is, after some time, supplied by forest trees of the same kind as those that were allowed to remain. The second stage of vegetation described in para. 15, and which may be styled forest jungle, in contradistinction to forest trees, only makes its appearance, (except where growing naturally) on spots where wholesale clearances have been made of all the trees of the forest.

and there some old or deformed trees, or trees decaying from being covered by creepers, or with the large holes in them, &c. &c., existed, I found them accompanied by vast numbers of seedlings. It would thus appear that with the mature trees injured in their growth, or trees progressing to palpable decrepitude, the vegetative force of nature not being called away to the formation of woody structure, or to the support of a large mass of substance, is directed to the effectual development of the seed. So striking is this fact, that one might almost think the plant gifted with volition, and that, conscious of decay, it hastened ere it disappeared to shed its representatives around it. I do not mean by this to say, that a teak tree in its prime does not produce seeds; on the contrary, it does so in abundance, but they never come to anything until the individual shall have reached the decadence of such prime.

23. This is the reason why, that in tracts where teak abounds, you always find it very nearly of the same size and age, either all full grown or half grown, or seedlings; still they are always palpably of the same generation. Not, as with mankind, where we find in every society a due admixture of old age, youth, and childhood.* Except that in the case of very young seedlings, there *may* be a few rapidly disappearing individuals of a former generation left. If my view then is correct, and we take a forest of fine

* It is not to be doubted that there may be found occasional exceptions; but these, if any thing, would rather tend to confirm the rule. The first years of the existence of the teak plant appear to be occupied in attaining height. Thus a very few years difference in the age of two seedlings, offsprings of the same tree, makes an extraordinary difference in their appearance. And the elder, of some 15 years of age, would appear not of the same generation as the younger, of but a month's date. In the lapse of years, however, this disparity disappears, and the full grown teak tree, of 185 years of age, would equal in size and appearance one of 200 years. An illustration of this is shown in the case of a patch of very numerous young teak, about half an hour's march from the bank of the river in the march from *Khyouk-pouk Tsukan* to the *Thoungyeen*. Here some half dozen older trees have been shedding their seed for the last 15 years or so, and they are surrounded by seedlings varying in height from one foot to 20 and more. These last have almost the appearance of young teak in contradistinction to seedlings, and an instance at first sight appears of an admixture of "old age, youth and childhood," in reference to teak. But on examination it will be shown, that none of these apparently *young teak* have the marks of seed-capsules, whereas the old ones are covered with them; thus showing that the seedlings could not have been the produce of the young teak raised with them. Again, at times very young seedlings may be found without any old tree near them. In such cases the parent tree has fallen down, and got destroyed or otherwise disappeared, leaving alone the many ways in which seeds may be conveyed by storms of wind, by birds, and even in the rough fun of animals, &c. It is probable that the remarks in the text with reference to teak, are just as applicable to *all* forests in a state of nature. Any one who has seen either the forests in the North of France, or Southern Germany, or even forest plantations in England and Scotland, must be aware that when standing in the middle of a given space which the eye can contain, all the trees are nearly of the same size, and thus he can see a considerable distance between the stems of the trees; whereas if these trees were accompanied by swarms of seedlings of varying height, the line of vision would be perfectly obstructed.

trees, the process would be this. Nature would first rear a forest of trees; they would grow up side by side, all nearly of the same size and age; when they had fulfilled the obligations of their growth, and were nearly all about the same time hastening to decay, they would simultaneously, before they disappeared, scatter their young around them. A new forest would thus rise, with individuals of nearly all the same size, to go through the same process. If, however, such a forest in its full prime were worked, the forester would hasten to kill every tree at once, and thus most effectually prevent the teak re-appearing.* If, however, there happened providentially to be some imperfect or malformed trees, or crooked in shape, or otherwise so injured as not to be worth bringing away, these would remain to form centres of propagation and the forest would revive. This is the reason why teak seedlings are so abundant in the middle and upper Thoungyen; whereas, on the flanks of the Kamoklah and Kyoukhet spurs, as also on the Attaran, they are not to be found, except in very rare instances. From the great admixture of lime in the soil of these last mentioned districts, the

* "As a corroborative illustration of this point, the following extract is appended from an article entitled, *TEAK FORESTS AND TIMBER TRADE OF THE TENASSERIM PROVINCES*, from the *Maulmain Chronicle* of the 23d December, 1846.

"It has been remarked, that where teak forests have been worked out by the wood-cutters, that no young trees have been raised up in the same forests to fill up, and supply the places of the parent tree, but that forest trees of a different description invariably spring up and occupy the ground from which teak trees have been taken away. This curious fact is well known to the Karens and Burmese wood-cutters, and has no doubt been noticed by many European observers before. The reason that might be given for this is, that the ground has exhausted its strength in bringing forth and rearing to maturity the vast forest of trees that cover the face of the country, and is not in a state to support and nourish another generation of young trees. Young teak are, notwithstanding the above remarks, very plentiful, springing up spontaneously in new localities. They are scattered about in many places, the young plants choosing as it were new spots and tracts where no old trees exist. Whenever the soil is congenial to their growth they thrive well, and do not require assistance; unassisted nature alone takes the task of rearing teak trees for future supplies, and will do so more efficiently, than by any artificial nurseries, that may be made by man. From the number of young teak trees found growing scattered in every direction, there is no reason to apprehend a want of teak for the future, although it is by no means improbable that before the young trees attain a mature age and are fit for cutting, the teak trees worth felling will be exhausted."

With reference to the above extract, it is very evident, from its own showing, that the reason why young teak do not appear in localities "where teak forests have been worked out by the wood-cutters," cannot be because the ground has been exhausted of its capabilities of again rearing a forest type of vegetation, seeing that it is immediately said "that forest trees of a different description invariably spring up and occupy the ground from which teak trees have been taken away." Again, the circumstance of young teak being found generally all of the same size, and not mixed up with mature trees is noticed. But if by their springing up spontaneously, it is meant that the soil produces them by any creative energy it may have in itself, or in other words by equivocal generation, and that they are not the produce of the seeds of some parent trees, it is to be feared that modern botany would scarcely concede to "unassisted nature" the possession of so strange a power.

vegetation is so powerful and vigorous as scarcely to admit of imperfectly grown trees, (in other words centres of reproduction,) they, being all in their full prime, are being killed, and are rapidly disappearing without leaving any representatives behind them.

24. In the middle and upper Thoungyeen, the greatest enemy to the teak tree is a species of parasitical ficus. It is curious to see the process by which this plant entirely destroys a tree. At first, under the guise of a slender and graceful creeper, scarce the thickness of a finger, it appears only to appeal for support. In its second stage it may be seen spreading out the woody structure of its stem and shooting its light foliage far above the original tree, yet appearing, however, to vegetate with it, as it were on equal terms. Till last comes the closing scene, the parasite has entirely enveloped the original tree in its deadly folds, and absorbing all the juices of its life, nothing remains but the projected stump of some withered arm, to show that any other plant had once been there. Yet, this parasite appears never to attack trees of a perfectly vigorous and healthy growth; and thus it is that I have never seen a single instance of its presence in the forests of the Attaran or of Kamoklah and Kyoukhet.

25. I have but a few remarks to make on the Attaran forests. The only tract in that part which I was enabled to visit were the forests on the Zimmay branch of the Attaran; having been disabled by illness from proceeding to the Wienyo.

26. The forests in the Attaran river are not like those on the Thoungyeen, situated on an elevated plain. The whole extent of country being on the same level as the plains of Maulmain. I found, however, the same kind of soil obtaining as on the Thoungyeen; namely, clay resting on compact sandstone, but the bed of rolled pebbles, and concrete was absent. The underlying sandstone, likewise, instead of occupying the prominent part it did in the Thoungyeen forests, even altering the nature of the superincumbent vegetation, was very subordinate, and would in a great measure escape the notice of a casual observer. The Attaran plains are intersected by several ranges of hills. The most easternmost, being one called the Toungwine, separates the forests on the Zimmay from those called the Upper Mitigate. Between the Zimmay and the Wienyo again, is another range of hills bearing various detached names. And to the west of the Wienyo is a third range intervening between it and the sea. All these three ranges are composed of limestone; they are somewhat low, but very precipitous, and their peculiarity is that they do not consist of continuous ranges, but of small detached ones, all running N. and S., and occupying different positions in the plain and at varying distances from the streams. The consequence is, that the original clay has been much mixed with their lime, and the soil is of the same marly nature as the forest tracts on the flanks of the Kamoklah and Kyoukhet spurs. The vegetation likewise is exceedingly vigo-

rous ; the underwood in many places impassable. The Attaran teak is therefore much more rapid in its growth, attaining a larger size in a shorter time, and is altogether of a far more compact and sound substance.* On account of this propitiousness of soil and consequent vigour of vegetation, it happens that scarcely any imperfect or malformed trees, or trees decaying in their growth, or (as I have before shown) in other words, centres of propagation, are to be met with ; and ergo, no seedlings. This absence of seedlings is a characteristic mark of the Attaran forests.

27. The only way in which reproduction could take place in the Attaran forests, would be by leaving a few trees scattered over an extent of country, to grow old, die away, and produce seedlings during the latter period of their existence. But this is prevented ; for any tree that can possibly be a source of gain is cleared away. And from the accessibility of these forests, their short distance from Maulmain, and the navigation of the river offering no obstacles, any crooked or deformed trees which may exist, and would have been left standing in the Thoungyeen, as not worth the expence of removal (and therefore ultimate sources of germination,) are in the Attaran forests cut for the purpose of supplying crooks for ship building.† Thus it is we are thrown back to a former period, when these forests were allowed to go through the processes of nature. The young teak (in contradistinction to seedlings) which we *do* find on the Attaran, are representatives of seeds that germinated some fifteen, twenty, or thirty years ago, when the plant thrived unvexed by the presence of man. Another peculiarity is, that the force of vegetation being so powerful in the Attaran, stumps of felled trees invariably throw out a number of sprouts, which, after attaining to a certain height, become very crooked and thus afford a continued supply of crooks.

28. The Attaran teak affects the banks of streams not on account of any partiality for water, but merely because there, as in all flat countries, the land immediately bounding the stream is the highest. The land extending between two streams is like a saucer, lowest in the centre ; and however adapted for rice cultivation, is invariably shunned by teak.

29. I have already alluded to two existing causes of injury to teak. 1st, The formation of *Toungyas*. 2nd, A parasitical creeping figus. I never found one instance of the last in the Attaran forests, as it would appear that this foe never attacks any but plants of a less vigorous growth. The first likewise is very subordinate in the Attaran. The Karen population is very scanty (although there is going on a steady immigration from the Siamese states.) But in any case the Attaran forest districts could support a nu-

* Vide Tabular Statement A, appended, showing the girths of trees of different ages in the Attaran and other forests.

† Vide Tabular Statement B, showing the proportion of crooks to logs of all sorts which came from the Attaran, and from all the forests, foreign and British, via the Salween river.

merous population without in any way interfering with the localities affected by the teak plant. For as the whole extent of country is a plain, intersected by an immense number of streams, and, as I have already remarked, the central portion between two bounding streams is the lowest, there is to be found there, an accumulation of moisture and soil adapted for rice.

30. A third supposed cause of interference, is the injury done to young plants by allowing a tree when felled to fall of itself and not lowering it with ropes, &c. I think that such causes of injury are so slight and local as not to be worth notice. Timber is expressly and invariably dragged in the wet weather, when the surface is moist and slippery, because it thus requires one tithe of the labor necessary in other seasons, when the surface is rough and impeding. For the same reasons foresters, in dragging a tree, go out of the way to get into a track formed by a preceding log, which has smoothed the way before it.

31. But there is a fourth and last supposed source of wholesale destruction to teak forests, which has been often insisted on in unmeasured terms, and which consequently deserves a careful consideration. I allude to the periodical fires which take place in the month of April, when all vegetation is so dry and parched up, that even the ashes of a passing pipe might set a whole kingdom in a blaze. These fires are generally caused by persons burning the vegetation they have felled, for the purpose of clearing a space for cultivation, but are also very probably occasionally spontaneous.

32. It is astonishing how the effect of these fires have been exaggerated. There is something so grand and awful in the phenomena which attend their path, that the mind is naturally pre-disposed to fancy their effects must be as fearful as their appearances. It is easier to imagine than to describe the progress of one of these great conflagrations; whirling in wild gyrations over forest and plain; sweeping in eddies round some spot, which all human speculation had doomed as its inevitable prey, leaving it unscathed; and hastening to the destruction of some locality which appeared safe beyond its utmost verge. It may thus be seen crossing the beds of deep streams, sending the messengers of its march far before it in the shape of long flakes of igniting matter. Seeing, then, how freakful and exulting an enemy it is, and how it mocks all control, it seems futile to think of circumscribing its career, or even modifying its course, by digging trenches or clearing small circumferences of jungle. From the accounts one reads it would appear almost as if the element was endowed with a powerful volition, and very much given to the destruction of young teak. Recurring, as these conflagrations probably have done, through a long succession of seasons, if their effects on the youthful vegetation were really as destructive as supposed, they would long since have converted the forest into plain. Whereas each indi-

vidual is as stately and each family as numerous as when vegetation first began to clothe the bosom of the ground.

33. It should be remembered that though the fire may consume the stem of the young plant, it does not consequently injure the root. It is surprising to what a small depth of soil the heat of a very great conflagration is able to penetrate. Each successive destruction of the stem throws accumulating vigour into the root; till at last, aided by the ashes of its former self, the plant is enabled, during the interval of visitation, to shoot itself safe beyond the influence of the destroying element. This fact is curiously shown by the circumstance that when a number of seedlings are found at the foot of some parent tree, and the surrounding ground bears the palpable marks of the last fire, the seedlings varying in height from 1 foot to 12 and even 15 feet, will be found free from the slightest marks of fire. It is evident, therefore, that they must have all sprung from the ground at the same time since the last fire; although, from their varying heights, and concentric wood-rings, actually seedlings of different years. Another illustration was in the case of two seedling trees in the Attaran, near the Goonghee creek. They were both within nine feet of one another, near a solitary old tree, which was evidently their common parent; they were both nearly the same height of 15 feet. The ground, and every object around, bore the marks of the last conflagration, and the only difference was, that whilst the thickest and eldest was smirched with smoke, the stem of the other was perfectly clean, showing that it had sprung up after the last fire. Thus the older had already successfully withstood the effects of the last fire, whilst the younger, having since that date reached the same height, and nearly the same substance, would probably be as victorious over the succeeding ones. It should be remembered, that it is the long dry grass and crackling underwood, which supply the devouring element with life. Hurried on by the terrific draft itself creates, the slightest pause would be fatal to its career. A tree full of sap and green vigour requires a regular roasting before it will succumb; with such the fire does little more than flicker up the trunk, licking off the dry moss and unsightly parasite. It destroys only those trees which have been felled and left lying on the ground, the effect of a conflagration on such prone trees is most destructive. In the wide extent of forest I have visited, I have never seen a single instance of a healthy and sound plant permanently injured by the fires. Again, if we take into consideration, the fact that every tree brought into the market is killed and allowed thoroughly to dry and season for three years; and is in this state exposed, *standing*, to the attacks of three successive conflagrations, and that few bear the slightest marks of fire; it will be evident that the destructive effects of annual fires have been much over-estimated. I cannot but think, therefore, that any money expended in the prevention of the attack of these fires will be thrown away. The more so, that taking into consideration how rapidly a dense and stifling

underwood springs up in this climate, it is probable that so summary an admission of ventilation, just before the setting in of the rains, is highly beneficial to the nobler plants of the forest.

79. I will now refer to the subject of nurseries or artificial sowings of seed. The remarks which I have already hazarded, on the mode of the spontaneous reproduction of the plant, will render this subject much more simple.

80. Self-sown seedlings being so abundant in the Thoungyeen, there would be no need of nurseries there, except, perhaps, on the flanks of the Kamoklah spur. It is on the Attaran, where the plant is rapidly disappearing, from the causes I have already alluded to, that some artificial measures might be adopted.

81. I have, at some considerable length, dilated upon the circumstance of the seed of a still growing vigorous teak tree not germinating. I do not mean to say but what there may not be some rare exceptions; but the broad fact, I feel assured, will only be confirmed by further examination. It may be said, that, perhaps, the reason of seeds not germinating in the presence of vigorously growing plants, is not so much from want of germinating power in themselves, as from the ground, already taxed to the uttermost for the support of one giant brood, refusing to exhaust itself by attempting to rear another. To this, however, I cannot agree, as I have seen many instances of vigorous young plants, rarely scattered here and there, from 15 to 20 years old, covered with the empty capsules of fallen seeds, and yet having no seedlings around them. The only modification of my opinion, which I could concede, is that in favorable circumstances, where the teak has been pretty well cleared away, those vigorous young plants which are left, may produce, by the kindly force of nature, germinating seeds, sooner than they would have done had they been in a crowded company.

82. It is well known that every attempt at artificial sowings have proved a failure. I will endeavour to point out what I consider the reason, viz. that instead of imitating nature, her processes have been strangely violated.

83. One locality was selected for planting seeds, because, from the number and magnificence of the teak trees on it, the ground was argued to be peculiarly favorable to the plant. What I have already pointed out, (viz. the fact of seedlings not being found in the immediate presence of vigorous trees,) will show that this was just the very reason why it ought to have been shunned. Again, on the next and last occasion, a space of ground was cleared and kept clear, long ridges were thrown up, on which seeds were planted in drills and rows, and were expected, like the teeth of the dragon Mythology, to start up in files and platoons. Here again the feelings of nature were violated, the access of the sun and the infringement of the rain, altered the nature of the soil, and robbed it of its capabilities of raising a forest type of vegetation.

84. I would, therefore, recommend that in the case of artificial sowings, the process of nature be imitated as much as possible. I would select a locality, in every respect preserving its forest type, on which there was little or no teak, but which had once been a notoriously favorite locality of the plant. I would then proceed to sow the seed with spargent hand, without any regard to regularity, and system or arrangement. And although, perhaps, I would not have sufficient presumption to imitate nature in her higher combinations, and set fire to the seedling in order to see it rise again, as if refreshed with sleep, yet I would leave it entirely to the varying vicissitudes of its fate, and try if by that means I could not see a vigorous healthy brood arise, instead of one single sickly solitary exotic. For it should not be forgotten, that out of the many hundreds of thousands of seeds planted by government, one only has come up.

85. With reference to the proper time of killing or girdling the teak trees, I must mention that the Karens declare that they ought to be killed in September, just as they are getting into full flower. They say that then the tree dies sooner, the bark comes off easier, and it seasons quicker. On this point I can form no opinion, as I think it ought specially to be referred to a scientific botanist "whether the girdling a tree in full flower is detrimental to the wood."

* * * * *

True extract.

(Signed) THOS. LATTER,
Superintendent of Forests, T. P.

A.—Abstract of centre Girth of 170 Logs of various kinds of Timber.

Description of Timber.	Ages.	Average centre Girth.		Increase of each period.		REMARKS.
		feet.	in.	feet.	in.	
70 Logs of Thoung-yeen timber.	under 80 } 6 Logs.	4	10	"	"	
	80 to 120 } 22 Logs.	4	6	Less than above.		
	120 to 160 } 23 Logs.	5	9	"	11	
	160 to 200 } 5 Logs.	7	10	2	1	
	200 to 240 } 9 Logs.	8	"	"	2	
	240 to 280 } 3 Logs.	8	1	"	1	
	above 280 } 2 Logs.	9	11	1	10	

Description of Timber.	Agos.	Average centre Girth.		Increase of each period.		REMARKS.
30 Logs of Thoungyeen timber brought down on contract. N. B.—Undersized logs selected. ..	under 80)	3	3	"	"	
	12 Logs.)					
	80 to 120)	3	8	"	5	
	17 Logs.)					
	120)	4	9	1	1	
	1 Log.)					
50 Logs of Attaran timber.	under 80)	6	1	"	"	
	8 Logs.)					
	80 to 140)	6	5	"	4	in 60 years.
	12 Logs.)					
	140 to 180)	7	2	"	9	
	20 Logs.)					
	180 to 220)	7	7	"	5	
	6 Logs.)					
	220 to 260)	8	3	"	8	
	3 Logs.)					
	283)	7	5	"	"	
	1 Log.)					
20 Logs of Lhingbway timber.	under 80)	4	2	"	"	
	5 Logs.)					
	80 to 120)	5	1	"	11	
	14 Logs.)					
	130)	5	"	"	"	
	1 Log.)					

B.—Memo. of the number of Rough Logs, Ship Crooks, Boat Crooks, Stem Pieces, imported into Maulmain.

	By what River.			
	Salween, Thoungyeen, and Gyne		Attaran. . . .	
	Number of Logs.	Number of Ship Crooks, Boat Crooks, and Stem pieces.	Number of Logs.	Number of Ship Crooks, Boat Crooks, and Stem pieces.
From 6th June, 1843, to 30th April, 1848, .. }	96,180	10,282	26,548	26,118

Extracts from previous reports in the office of the Superintendent of Forests, referring to the subject of young Teak.

Extract of a Report from Captain C. S. GUTHRIE, No. 240, of 20th June, 1846, to Commissioner of Tenasserim Provinces.

Para. 14. *Middle Thoungyeen.* Mecrawaddy to Meiplai. From what I saw, and from as much information as I could procure, I estimate the number of teak trees at 5,200, exclusive of seedlings which abound; viz. above 6 feet 1,200, below 6 feet 4,000. The teak here was not of fine growth, and appeared to suffer more from large parasitical creepers than any other tree.

Meiplai Creek. I did not visit, but have received information from Mr. Maling, who worked it last season, and from others. The estimated number of trees is 6,400; 2400 being full sized. This locality is described as being easily worked, and the trees of fair straight growth. Young trees are in abundance; there are about 2,100 trees fit for felling, most of which I have reason to think are undersized.

Meiplai mouth to Kamoklah. Teak seen in considerable plenty on both sides of the river; landing repeatedly. I was disappointed in the appearance of the teak, very probably from all the fine trees being felled near the river. On reaching Kamoklah, I ascended the hill. I saw many first class trees, and have little doubt that much fine timber will be procurable from this locality. I estimate the contents of these forests at 13,000 full sized, and 16,000 undersized, exclusive of seedlings, which are in considerable numbers.

Kamoklah to Wiensaw. From the former place to as far as Tigahore stream, containing a number of very fine young trees, the best forest I had seen, I find in my note book, "Note!—This locality should be reserved for any Government purpose." There is some difficulty in dragging the timber, on account of many small hills and water-courses. Below Tigahore to Wiensaw, the trees run small. The total estimated number of trees 23,070; 5,070 being full sized; the very young teak is not so plentiful as above Kamoklah *

* The absence of seedlings on the flanks of the Kamoklah spur is noticed, para. 23.

The northern flank alluded to by Capt. Guthrie was much worked by natives, long before any European had ever visited it, and it is more strikingly deficient in very young teak (seedlings) than are the forests on the southern flank, or above Kamoklah. The forests on the northern flank of the Kamoklah, from Tigahore to Wiensaw, were of the type of the Attaran forests, viz. all vigorous sound trees, growing on a marly soil. Most of the trees were killed in their prime by natives, before having produced germinating seeds, and therefore there exist there few seedlings; as noticed in the text by Capt. Guthrie.

48. Extensions of forests by artificial means. I quote from D. Helfer's Report regarding the system of artificial extension of forests. "I would differ from that adopted by the Dutch in Java; it is an old expression, that forest trees do not thrive well if they are treated like fruit trees, or other delicate plantations. The system of nature should be imitated. No nursery beds and no transplantation should be employed. After having cleared the jungle in the chosen places, and after having loosened the soil sufficiently to receive the seeds and to be able to cover it with a little earth, I would advise the seeds being disseminated without any further care. The plantation must of course be enclosed to prevent the disturbance by any kind of wild animals. After two or three years the plant, when sprung up too close together, ought to be thinned, besides jungle parasites and other impediments removed. This easy operation should be annually repeated in different parts of the country; over wide tracts, localities affording facilities for the transport of timber, such as rivers and nullahs, ought of course to be the first chosen."

(Signed) C. S. GUTHRIE, Capt.

Extract of a Report from Captain C. O'BRIEN, to the Commissioner of Tenasserim Provinces, dated 21st April, 1844.

Para. 9. Crossed the river and examined a teak forest on the Meypo river, which runs into the Lhingbway from the north-west.

Six furlongs from the bank of the latter river crossed a branch of the Meypo, known as the Chambariew; within this space are a few fine straight trees, the greater number of which have been killed by a Karen who has a grant. On these hills are scattered trees of large growth. Many fine trees are also immediately south of the boundary stream. Of the hill trees I measured one 11 feet 6 inches in circumference; another, age 250 years, (progressing to its 280th,) circumference at the smaller end 8 feet 2 inches. From a tree which had fallen, uprooted, a short log had been cut, which showed it to be perfectly sound at 10 feet from the root, age 185 years, circumference 7 feet 10 inches. During my tour through the various forests, I have never seen a seedling teak till to-day, but here found them very numerous above the boundary stream, where young teak occurs for some distance, almost unmix'd with other forest trees, and are apparently very flourishing.* I have hitherto ascribed the total absence of seedling trees in the forest to the circumstance of the numerous fires that have taken place

* It is worthy of note here, that these seedlings, seen for the first time by Capt. O'Brien, appear to have been in company with very old trees, as shown by their recorded age, some having even succumbed through age. These old trees appear also to have been "scattered," and not crowded, and the whole is a corroboration of the views advanced above.

in every part of them since they have been worked, consuming the young and tender trees, and still believe such to be the case.

* * * * *

The prevention of such fires will, I fear, prove a matter of extreme difficulty. The absence of seedlings may, however, be attributable to the nature of the tree; the seed is perfectly round, hard, and light; about the size of a small hazlenut, and is shed in February and March, when the ground is dry and hard. It is therefore, readily removed by the first rains into the beds of the small streams, and thence to the rivers, and tide water, or low situations, which are unfavorable to its growth; and it was justly remarked by Captain Tremenhere, when with me, that the teak is almost invariably found on that side of the stream on which the bank is lowest, where the seeds has probably been deposited or accidentally arrested in its course. We had a strong proof of the inaptitude of teak to propagate itself on the Weinloun river, (in the Attaran) on the 11th of March, where we met with a clump of fifteen trees, no others occurring for several miles, and of these two or three were full grown and apparently vigorous trees, whose seed had been shed on this spot for probably upwards of a century.* The ground on which the seedlings are found (on the Lhingbway) is remarkably flat, small rills running all through it. The bed of the Meypo, from its tributary sources, as well as the plains on its banks, is of limestone formation, and I should think, from the straight growth of the present timber, the number of fine young trees, and the self-sown seedlings, this is the most favorable locality I have yet met with for forming a nursery, or sowing seed along its whole extent. The trees near the main river, killed by the Karen, afford a valuable proof, from their straightness and size, that the soil in the lower part of the stream is equally favorable to the growth of teak, as when we find them so numerous towards its source.

(Signed) C. O'BRIEN.

Extract of a Report from Mr. SMITH, Assistant Surveyor, Forest Department.

With reference to the teak in the Meiplai district, I have the honor to state, that I observed between the mouth of the Meiplai and the Mekanai khyoung but few trees. These were, I believe, in every instance in dry situations. Among some patches of very old trees, I noticed an abundance of seedlings. On the Mekanai khyoung are a few small patches of teak. On

* Here again is described a clump of young fine teak trees, some two or three of the elder ones, of which it would appear had reached maturity, and were in great vigour, and yet their seed had been ineffectually shed for many seasons. Whereas the seeds of the very old trees, rarely scattered, mentioned in the first portion of this extract, had germinated most effectually. This also corroborates the remarks made in para. 22.

the Lamma khyoung, near its mouth, saw two patches of old with young teak. Continuing up the Meiplai, I noticed but few patches of teak. On the left bank of the Meiplai, up the Pantaroon khyoung, teak is abundant. Near the site of the old town of Hlinewaddy, westward of the Meiplai, saw a patch of ten large and many seedlings. Between the mouth of Lamma khyoung and Kyouk Pouk road, saw a patch of six large trees and many seedlings; also another lot of fourteen trees on the left bank. Near Tathoo khyoung saw two patches of teak on the left bank; also thirteen trees by the Teewablaw khyoung. Towards Pyeemah khyoung, saw only three or four trees. Going on to Thaidoo khyoung, passed two patches of teak on the right bank; to Nyabalaw khyoung, passed a lot of eighteen trees on the left bank; further upwards, by the Makkah and Teewakalike khyoung, on the left bank, passed large quantities of teak, growing on the hill sides, but there were few very old trees or young seedlings. On the south-west flank of the Kamoklah, passed many fine teak trees, growing on the steep sides of the hill, but they were in situations difficult for their removal. These were the last noticed in the Meiplai side of the hill. Of the trees above noted, none were growing in wet or moist places.

(Signed) W. SMITH.

ON THE CULTIVATION OF GUINEA GRASS.

To JAMES HUME, Esq., *Secretary Agricultural and Horticultural Society.*

DEAR SIR,—I have the pleasure to send you a paper on the culture of Guinea grass, which I hope may deserve a place in the Journal of the Society.

The paper, from the name on the face of it, appears to have been addressed to Sir Wm. Jones, in 1793.*

Your's faithfully,

Katsody : 17th October, 1848.

THOMAS WATKINS.

GUINEA GRASS.

The cultivation of Guinea grass in the western parts of our provinces, would unquestionably be productive of the greatest importance and advantage to the country; and even here, where the fodder for cattle is extremely bad, and often scarce, it might be worthy of regard.

The want of good fat oxen on the momentary emergency of a war, for which this country should never be unprepared, would be of no trivial utility,

* It is included in "a Treatise on the cultivation of Sugar-cane and manufacture of Sugar," by W. Fitzmaurice, which was published in Calcutta in 1793, and dedicated to Sir Wm. Jones.—Eds.

and would obviate many inconveniencies to which our troops are liable even on the yearly relief.

Guinea grass, which grows on the most sandy desert or mountain, when it has once effectually taken root, puts it almost beyond possibility again to eradicate it, it is perhaps the best fodder produced on earth, its properties in the conclusion.

Preparatory to planting, let the ground be cleared (by burning) of all other productions, set the people to dig shallow holes through the field in regular rows, at the distance of four or five feet asunder, or at the distance of ten feet in case of a scarcity of seed or plants.

When the ground is thus prepared, at the commencement of the rains, plant four or six grains of the seed, or half the number of slips of old Guinea grass in each hole, slightly covered with mould, with the ends of the slips open to the air, planted across the hole, they will in two or three days shoot forth young grass.

Four or five weeks after the grass is planted it should be well cleared of all other weeds and shrubs, the roots moulded up, and so on until it begins to seed, when it should again have a thorough cleaning, and let it remain till the seed is dropping off: at this time it will be five feet high, then the stock should be turned into it, the cattle feeding over the field of grass help to trample and plant the new seed in the ground; when the grass is sufficiently trampled in the earth and eat down, it should be cut close to the roots, and a fire set through it, but should be done as the rains begin to fall, the grass will then spring up as thick as clover, and is ever afterwards established, and fattens the most reduced horses or bullocks in a few weeks; stock has been recovered by Guinea grass in America, which were so low, that when put into this kind of pasture they lay down and fed on the grass on each side within their reach, till they gained strength, and afterwards improved so fast that they appeared almost like wild cattle in less than two months, or by the time they were wanted to work in the mills.

Guinea grass in Jamaica, previous to the American war, was cultivated only on those plantations which could afford a small piece merely for recovering lifting steers* after crop, and if a sugar-work had fifty acres under grass, it was considered a great deal; there were then no more cattle bred than were barely sufficient to supply Saint Jago de-la-vega and Kingstown, with beef at 20 pence per pound; the plantation never saw fresh beef, they were obliged to live upon salt beef from Ireland, and their poultry, the island of Cuba supplied Jamaica with oxen, horses and mules, to the number of 50,000 annually, for which the Spaniards drew an immense sum in specie from the islands, and proved extremely distressing to the British planters; this trade it is probable would have continued since, were it not for the American war,

* The steers which work in the waggons carrying the sugar to be shipped, are often so reduced by the end of the crop, that when they lay down they cannot rise without assistance.

by which salt provision, in the first place, rose to an extravagant price, and but very little was brought to the island ; the trade being diverted by various casualties elsewhere ; the Spanish war put an end to the Cuba trade (as it was called) and the army and navy's demands rose fresh provisions to a most grievous price ; as necessity is well called the parent of industry, the small settlers turned their attention to the breeding of stock, great tracts of the interior wood-lands were cleared away, and formed into extensive Guinea grass pastures, and as expeditiously converted into breeding pens ; on the fourth year, after the distress occasioned by the non-importation of cattle from Cuba, it was amply obviated, and the great inconvenience arising from the extravagant price of fresh meat, was remedied, as beef fell from 20 to 5 pence per lb. This successful effort gave birth to another, a charming breed of English horses was introduced, and at length an English breed of oxen ; the ready cash before annually drawn from the island by the Spaniards, was now circulated on the island to the advantage of the Guinea grass planters. Hence it was that the cattle in Cuba became so numerous, that the Spaniards now frequently kill them in the open field for the sake of the tallow and hides, leaving the flesh to the birds of the air ; there was not an acre of Guinea grass in the whole island of Cuba, it being all in valleys and plains of common pasture.

It was computed, that between 1772 and 1792, 150,000 acres of Guinea grass were planted, and 30,000 head of stock annually raised in Jamaica ; notwithstanding that increase, the price of working steers, horses, and mules, kept up on account of the annual demand ; for the sugar estates, only breeding farms in the West Indies, take three years to establish them, but the capital required here would be so trifling in comparison, and the advantages of every other kind so many, that it would require both less time and trouble, to which we may add the great difference between the price of labor in the East and West Indies.

To the colony of South Wales, Guinea grass farms, to support a good breed of stock, would soon remedy all the disadvantages there complained of, and at the Andamans, it is worthy of consideration, how far it would prove useful there, the island being situated centrally for the exportation of cattle on emergency, or victualling of merchantmen.

It would be only requisite to clear away the underwood at the Andamans, for the cultivation of Guinea grass. In Jamaica all the timber trees are spared in clearing, to be cut down for use when wanted.

Some account of the Nutmeg and its cultivation. By THOMAS OXLEY, Esq.,
A. B., Senior Surgeon of the Settlement of Prince of Wales' Island, Singapore and Malacca.

The *Myristica moschata*, or true nutmeg, is known to botanists as a tree belonging to the Natural Family Myristicaceæ, Class Diœcia, Order Monodelphia of the Linnæan System. It would be superfluous to enter into a minute description of a plant already so well described, particularly by Roxburgh : I shall therefore merely notice some peculiarities that deserve attention. The tree, like many of its class, has a strong tendency to become Monœcias, and planters in general are rather well pleased at this habit, thinking they secure a double advantage by having the male and female flowers on the same plant. This however is delusive, and being against the order of nature, the produce of such trees is invariably inferior, showing itself in the production of double nuts and other deformities. It is best, therefore, to have only female trees with a due proportion of males. But few have the moral resolution to cut down the Monœcias tree, on the principle that something is better than nothing, but they forget that the Monœcias plants having much fewer flowers, it will take three or four of them to yield the same amount of pollen as the true male, and as for the produce yielded by such trees, that of one good female is worth a dozen of the other.

The female flowers, which are merely composed of a trifid calyx and no corolla, when produced by a tree in full vigor, are perfectly urceolate, slightly tinged with green at the base, and well filled by the ovary, whereas the female flowers of weakly trees are entirely yellow, imperfectly urceolate, and approach more to the staminiferous flowers of the male.

The shape of the fruit varies considerably, being spherical, oblong, and egg-shaped, but "*cæteris paribus*" the nearer they approach sphericity of figure the more highly are they prized.

There is also a great variety in the foliage of different trees, from elliptic, oblong and ovate, to almost purely lanceolate shaped leaves. This difference seems to indicate in some measure the character of the produce, trees with large oblong leaves appearing to have the largest and most spherical fruit, and therewith small lanceolate leaves being in general more prolific bearers, but of inferior quality.

The object of this paper being practical, I shall confine myself as much as possible to a record of an experience extended over a period of some 20 years ; and as the subject of spice planting has now become one of deep interest to very many of the Straits' settlers, I entertain a hope of being able to offer some useful hints to those already engaged in such operations, and a tolerably safe guide for future speculators. But I am by no means disposed to think that I can so exhaust the subject as leave nothing for future writers. being fully persuaded in my own mind. that the cultivation of

the nutmeg can still be greatly improved, and that in fact very little science has as yet been expended upon it.

The nutmeg planter, to use Colonel Low's expressive words, "must have the bump of perseverance myristicatically developed, and be impervious to compunctious feelings or opening his purse"; the combination also of an enthusiastic temperament with untiring patience is desirable. If he be in haste to get rich, let him attend to some other pursuit; but he has this consolation, that nutmeg planting properly conducted, although slow, is sure, and when brought to a certain point, safe and enduring; and he has the further consolation of knowing that nature has bestowed upon him a monopoly, for the nutmeg tree appears to be confined within comparatively narrow limits. Whilst its congener, the clove, has been spread over Asia, Africa, and West Indies, the nutmeg refuses to flourish out of the Malayan Archipelago except as an exotic, all attempts, hitherto made to introduce it largely into other tropical countries, having decidedly failed.

The Island of Ternate, which is in about the same latitude as Singapore, is said to have been the spot where it was truly indigenous, but no doubt the tree is to be found on most of the Moluccas. At present the place of its origin is unproductive of the spice, having been robbed of its rich heritage by the policy of the Dutch, who at an early period removed the plantations to the Banda Isles, for better surveillance, where they still remain and flourish. But although care was formerly taken to extirpate the tree on the Moluccas, the macco-feeding pigeons have frustrated the machinations of man, and spread it widely through the Archipelago of islands extending from the Moluccas to New Guinea. Its circle of growth extends westward as far as Penang, where, although an exotic, it has been cultivated as a mercantile speculation for many years with success, so much so, that doubtless the Penang planters think themselves more in a situation to give than receive advice. I shall therefore beg any of those magnates who may chance to cast an eye on this paper, to bear in mind that what they read is more peculiarly applicable to Singapore than any other locality, and that moreover, the plans laid down have succeeded here. Westward of Penang, there are no plantations, looking at the subject in a mercantile point of view. The tree is to be found, indeed, in Ceylon and the West Coast of India, but to grow it as a speculation out of its indigenous limits, is as likely to prove successful as the cultivation of apples and pears in Bengal.

In the Banda Isles, where the tree may be considered as indigenous, no farther attention is paid to its cultivation than setting out the plants in parks under the shade of large forest trees with horizontal branches, called "Canari" by the natives. Here it attains a height of fifty feet and upwards, whereas from 20 to 30 feet may be taken as a fair average of Straits trees; but notwithstanding our pigmy proportions, it does not appear from all I could ever learn, that we are relatively behind the Banda trees either in

quantity or quality of produce, and I am strongly impressed with the idea that the island of Singapore can compete with the Banda group on perfectly even terms. Our climate is quite unexceptionable for the growth of the nutmeg, being neither exposed to droughts or high winds; and although we may lose by comparison of soils, we again gain by greater facilities of sending our produce to market, by the ability of obtaining abundant supplies of manure, and any amount of free and cheap labor.

I shall now endeavour to lead the planter step by step on his weary way, but just to cheer him a little, he may have the assurance that a nutmeg plantation well laid out and brought up to perfection, is one of the most pleasing and agreeable properties that can be possessed. Yielding returns more or less daily throughout the year, there is unceasing interest, besides the usual stimulus to all agriculturists of a crop time, when his produce increases to double and quadruple the ordinary routine.

Trees having arrived at 15 years growth, there is no incertitude or fear of total failure of crop, only in relative amount of produce, and this, as will be seen, is greatly in the planter's own power to command. It is against reason to suppose that a tree always in flower and fruit will not expend itself if left to unaided nature; it must be supplied with suitable stimuli to make good the waste; therefore he who wants nuts must not be sparing of manure, but of this more directly.

The first requisite for the planter is choice of location. It is true that the nutmeg tree, aided by manure, will grow in almost any soil where water does not lodge, but it makes a vast difference in the degree of success, whether the soil be originally good, or poor and improved by art. The tree thrives not in white or sandy soils, but loveth the deep, red, and friable soils formed by the decomposition of granite rocks and tinged with iron, and the deeper this tinge the better. I am therefore inclined to think, that iron in the soil is almost necessary for the full development of the plant. If under the before-mentioned soil there be a rubble of iron-stone at 4 or 5 feet from the surface (a very common formation in Singapore), forming a natural drainage, the planter has obtained all that he can desire in the ground, and needs only patience and perseverance to secure success. The form of the ground ought to be undulating, to permit the running off of all superfluous water, as there is no one thing more injurious to the plant than water lodging around its roots, although in order to thrive well it requires an atmosphere of the most humid sort and rain almost daily. Besides the form of the ground, situation is highly desirable, particularly as regards exposure. A spot selected for a nutmeg plantation cannot be too well sheltered, as high winds are most destructive to the tree, independently of the loss occasioned by the blowing off of fruit and flower.

At present there is abundant choice of land in Singapore, the greater portion of the island being as yet uncultivated, and much answering to the

above description. The land can be purchased from Government at the rate of from 5 to 10 Rupees per acre in perpetuity. I would advise the man who wishes to institute a plantation to select the virgin forest, and of all things let him avoid deserted gambier plantations, the soil of which is completely exhausted, the Chinese taking good care never to leave a spot until they have taken all they can out of it. A cleared spot has great attraction for the inexperienced, and it is not easy to convince a man that it is less expensive to attack the primitive forest, than to attempt to clear an old gambier plantation overrun with the *láláng* grass; but the cutting down and burning of large forest trees is far less expensive than the extirpation of the *láláng*, and as the Chinese leave all the stumps of the large trees in the ground, it is also more difficult to remove them in this state than when you have the powerful lever of the trunk to aid you in tearing up their roots, setting aside the paramount advantage that in the one case you possess a fresh and fertile soil, in the other an effete and barren one, for if there be any one plant more than another capable of impoverishing and wearing out land, it is the gambier plant.

Forest land, or jungle as we call it in these parts, can be cleared for about from 25 to 30 dollars per acre by contract, but the planter had better be careful to have every stump and root of tree removed, ere he ventures to commence planting, or the white-ants, attracted by the dead wood, will crowd into the land, and having consumed the food thus prepared for them, will not be slow in attacking the young trees. Whilst the planter is thus clearing the ground, he may advantageously at the same time be establishing nurseries:—for these the ground ought to be well trenched and mixed with a small quantity of thoroughly decomposed manure and burned earth, making up the earth afterwards into beds of about 3 feet wide with paths between them, for the convenience of weeding and cleaning the young plants. Of course, if the planter can obtain really good plants the produce of well selected seed, it will be a great saving of time and expence to him, but unless the seed be carefully chosen, I would prefer beginning my own nurseries, and in the selection of seed would recommend the most perfectly ripe and spherical nuts. Oval long nuts are to be rejected, particularly any of a pale color at one end. Few things tend more to ultimate success than good seed, therefore too much attention cannot be bestowed upon it. I am of opinion, that planters have been hitherto very careless on this subject, hence we see such varieties of the tree, which is becoming every day what the gardeners in England call more sportive; this also partly arises from continuing to reproduce plants from those of the place, whereas were the planters of Penang and Singapore to interchange their seed, it would be mutually profitable. We know that the agriculturists of Europe find it to their advantage to obtain seed for their cereal crops from places remote, and even the inhabitants of the British Isles find it necessary to make such interchanges. It is

not easy to afford a reason for this, but the fact is well established, and would appear to be the fiat of infinite wisdom for some great good, perhaps to induce indolent and selfish man by the strong stimulus of self-interest to a mutual reciprocity and kindness of feeling, by demonstrating to him in so practical a manner that his own good is linked inseparably with that of his neighbour.

The planter having selected his seed, which ought to be put in the ground within 24 hours of being gathered, setting it about 2 inches deep in the beds already prepared, and at the distance of from 12 to 18 inches apart, the whole nursery ought to be well shaded both on top and sides, the earth kept moist and clear of weeds, and well smoked by burning wet grass or weeds in it once a week, to drive away a very small moth-like insect that is apt to infest young plants, laying its eggs on the leaf, when they become covered with yellow spots, and perish if not attended to speedily. Washing the leaves with a decoction of the Tuber root is the best remedy I know of, but where only a few plants are affected, if the spots be numerous, I would prefer to pluck up the plant altogether rather than run the risk of the insect becoming more numerous, to the total destruction of the nursery. The nuts germinate in from a month to six weeks and even later, and for many months after germination the seed is attached to the young plant, and may be removed apparently as sound as when planted, to the astonishment of the unlearned, who are not aware of the great disproportion in size between the ovule and albumen, the former of which is alone necessary to form the plant. The plants may be kept in nursery with advantage for nearly two years. Should they grow rapidly and the interspaces become too small for them, every second plant had better be removed to a fresh nursery and set out at a distance of a couple of feet from each other. When transplanted either in this way, or for their ultimate position in the plantation, care should be taken to remove them with a good ball of earth, secured by the skin of the plantain, which prevents the ball of earth falling to pieces.

The nurseries being established, the ground cleared and ready, the next proceeding is to lay out and dig holes about 26 or 30 feet apart, and as the quincunx order has many advantages, it is the form I would recommend for adoption. The holes should be at least 6 feet in diameter and about 4 feet deep, and when refilled the surface soil is to be used and not that which is taken out of the hole. Each hole should be filled up about one foot higher than the surrounding ground, to allow for the settling of the soil and sinking of the tree, which planted even at this height, will, in a few years, be found below the level. Over each hole thus filled up, a shed, closed on two sides east and west, and proportioned to the size of the plant, is to be erected. The best substance for this purpose is, I think, the Attap;—*láláng* grass and bamboo, occasionally used, have their disadvantages, the former attracts white-ants, the latter when commencing to decay, breeds a black

blight that is soon transferred to the plant, injuring it most materially. It is not a bad plan to leave an open space in the centre of the top of each shed about 12 inches wide, by which the young plant can obtain the benefit of the dew and gentle rains, which more than compensates for the few rays of sun that can only fall upon it whilst that body is vertical. After the sheds have been completed, each hole should have added to it a couple of baskets of well decomposed manure, and an equal quantity of burned earth, when all is ready for the reception of the plant, which, having been set out, if the weather be dry, will require watering for 10 days or a fortnight after, in fact until it takes the soil. As I have mentioned burned earth both for the use of the nursery as well as final transplanting, I may as well here explain what I mean by that substance: this earth when well prepared is quite black, friable and pungent of smell, containing potass and abundant small portions of charcoal. It is eminently useful in all kinds of cultivation, rendering friable the stiff clay and affording carbonic acid to the plants. The Chinese with good reason place much dependence upon it as a manure, and most of them know very well how to make it, but unfortunately it cannot be made in every locality, as it requires a very large quantity of firewood to prepare it properly, and is only really good when made of the peaty substance that forms the top surface of all the bottoms between the hills that spread over nearly the whole island of Singapore. This manure may be useless from two causes, either if overburned, when it turns red and is effete, or if not sufficiently burned, when it will be filled with chips and portions of unburned wood, and become a source of attraction to the white-ants, by no means desirable visitants. The earth so soon as prepared ought to be placed under sheds until required for use, otherwise it loses much of its stimulating properties, particularly if exposed to heavy rains.

The planter having set out all his trees must not deem his labors completed, they are only commencing. To arrive thus far is simple and easy, but to patiently watch and tend the trees for ten years after, requires all the enthusiasm already mentioned. About three months after planting out, the young trees will receive great benefit if a small quantity of liquid fish-manure be given them. In the first six years they ought to be trenched round three times, enlarging the circle each time, the trenches being dug close to the extremities of the roots which generally correspond to the ends of the branches, and each new trench commencing where the old one terminated, they must of course greatly increase in size as the circle extends, requiring a proportionate quantity of manure, but the depth ought never to be less than two feet. The object in trenching is to loosen the soil and permit the roots to spread, otherwise the tree spindles instead of becoming broad and umbrageous. This operation might with much benefit be performed ere the roots arrive at the outer rim of the already prepared soil, instead of the usual plan of waiting until they penetrate the unloosened earth, by which many of the

roots are necessarily obliged to be cut, and the tree thereby checked for some months. The present plan of manuring has invariably this effect, and might be altered with decided advantage, for it can never benefit a tree to cut and destroy the extremities of the roots by which it is mainly supported. Were the trenches therefore made in an advance of the roots it would be a very great improvement in the cultivation. As the trenches are now dug for the purpose of manuring, the usual mode is to throw into the bottom of the trench all the grass that can be collected, covered by a layer of earth, filling up the remainder with manure and earth well mixed, part of which ought to be used for top dressing, having previously scraped away the surface soil so as just to expose the extremities of the roots. In time the circles extending, will at last meet, and the whole of the ground having been by that time gone over, the trees ought to completely cover the ground, and top dressing will then suffice. This latter would at all times be the most economical mode of manuring, and might be given after every heavy crop, but as I before mentioned, it is essentially necessary to loosen the whole of the ground, or the thick fibrous root of the nutmeg cannot pierce through, and the plant will be stunted. Some persons apply their manure fresh from the stable or cow yard. There is no question that fresh manure enriches ground more than that which has undergone perfect decomposition, but unfortunately fresh manure when brought into contact with the roots of the tree destroys them, the ends blacken and decay, and in this state, if there be white-ants in the ground, they very soon attack and kill it altogether. Manure is beyond all other considerations the most important to the welfare of an estate; it is that which gives quantity and quality of produce, and without it a plantation cannot be carried on. The want of it must limit the cultivation in the Straits, and will yet bring up many a planter, who, having got his plantation to look well up to the eighth year with very little manure, thinks he can go on in the same manner. But trees grows readily up to the 7th or 8th year;—it is then that really good cultivation begins to tell, and, even with the best care, trees receive a check upon their first showing fruit, but the skilful planter about this period will redouble all his energies, knowing that he is near to his reward, and will lose it entirely if he omits to do so. The nutmeg tree likes well all sorts of manures, but that which is best for it seems to be the well rotted stable and cow yard manure, mixed with vegetable matter, and when the tree is in bearing the outer covering of the nut itself is about one of the very best things to be thrown into the dung pit. Dead animals buried not too near the roots are very acceptable to the trees, also blood, fish, and the oil-cake imported from Java, but the greatly lauded manure of the present day, Gauno, I decidedly object to. Having tried several tons of it I am of opinion, that it is the least beneficial substance that can be given to the nutmeg tree. It certainly causes the tree to assume a deeper tint of foliage, and at first to throw out young shoots, but there

seems to come a very unpleasant reaction afterwards, and I am inclined to think, the quality of the produce is deteriorated; at least such is my conviction on the subject that I shall never try it as manure again. With respect to the best mode of preparing and keeping manure I am disposed to the plan of placing it in pits, although in Europe stacking it in heaps is, I believe, generally preferred, but our climate here is so desiccating that manure thus exposed will lose too much of its moisture to ferment properly, and the loss will also be much greater. Besides if it be not required for immediate use, it keeps much better in a pit covered over by a coating of earth to prevent evaporation. When required for use it ought neither to be too dry nor wet, the best state is that of an homogeneous black paste. Equal parts of this substance and burned earth, such as already described, is the stuff to produce nutmegs, and he that uses most will get most. Slovenly cultivation is the most expensive in the end, and by far the least satisfactory.

But although manuring is the chiefest element in successful cultivation, there are many other matters for the planter to attend to during the period that his trees are growing. All bad grasses must be carefully kept out of the plantation, at least from between the trees, and the harmless grasses rather encouraged, as they keep the surface cool. I have seen the reflected rays of the sun from an uncovered whitish soil, regularly scorch up the leaves, although the plant was covered over on two sides, and the top by the usual artificial shade. The trunk of the tree ought to be carefully washed with soap and water once a year to keep it clear of moss, this has been ridiculed as being a work of supererogation;—let those who think so, omit the operation. Parasitical plants of the genus *Loranthus* are very apt to attach themselves to the branches, and if not removed do great injury, in fact, if altogether unattended to, they will in time destroy the tree. The enemies of the nutmeg tree are fortunately not numerous, but they have a few; white-ants among the number. I know of no remedy for these but cleanly and good cultivation: they seldom if ever attack a vigorous plant; it is upon the first symptoms of decay that they commence their depredations,—their nests may surround a tree and their small tunnels pierce the earth in every direction about its roots without the plant giving any indications of decay, but whenever I have discovered them in such localities I have always endeavoured and often successfully, to dislodge them by a dose of a solution of pig dung, an article apparently not at all to their taste, although fresh cow dung is a strong source of attraction, another reason to those I have already given for using this latter substance in a perfectly decomposed state when it can be well mixed up with the soil, and appears no longer to have an attraction for those destructive insects, which cannot be too jealously watched, for when once they attack a tree the case is hopeless. The first notice a planter has is the withering of the leaves, and when

he comes to examine he generally finds it necessary to dig up and uproot the plant at once, rather than leave it as a nidus for those voracious depredators ; every planter must lay his account to losing occasional trees by them, but he who has his ground clearest and most free of old roots and stumps of trees will lose fewest. There are several species of insects which lay their eggs on the leaves but they are not all of equal importance ; that which manifests itself by the discolorization of the leaf, and the larvæ of which are embedded in the substance and not on the surface, appears the worst, but all ought to be carefully watched and removed or they rapidly spread and cause great havoc amongst the trees. For this purpose it is necessary to wash the leaves with a decoction of Tuba root, and syringe them by means of a bamboo with chunam and water of the consistence of white-wash, this adheres to the leaves, and will remain even after several heavy showers, giving for the time rather an unsightly appearance to the tree, but making amends by clearing it of the larvæ already alluded to ; another nuisance is the nest of the large red ant ; these collect and glue the leaves together, forming a cavity for the deposition of their larvæ. All leaves thus made use of turn yellow and die ; they do not, that I have observed, otherwise injure the tree, but trees so infested do not bear well, and the ants bite the collectors severely, and indeed any person incautious enough to brush against the tree. The best mode of destroying them is to hang a portion of some animal substance, such as the entrails of a fowl or the like, to the end of a pole, the opposite extremity of which is allowed to pass through the branches, the ants will run along the pole and collect in immense quantities around the bait, when by a lighted faggot they can be burned by thousands. This operation repeated a couple of times a day for a week or so, will rid the tree of the invaders, their nests should be broken up by the collectors as they go their rounds, but this they are very unwilling to do, seeing that there are few insects more ready to revenge themselves, and the coolies never fail of a good biting whenever they try the experiment of disturbing them. I have now made the planter tolerably well aware of what he has to do and of most of the difficulties he has to encounter, I shall now endeavour to give some notion of the prices of labor and material, and speak of the work best done by contract, and that which one had better perform with the laborers on the estate.

The first operations of clearing ground and digging the holes can be done more cheaply by contract labor than by men on monthly hire, very little supervision in such case being required, as it is easy to see whether the ground be well cleared or not, and the size of holes being determined previously, there can be no dispute about the matter afterwards. It is surprising how much better the Chinese work when they are paid by the task rather than the day, and singular enough, they are better content, working harder and earning less by the former system than the latter. Few laborers in the world

can equal them when working on their own account, but on regular wages they are most complete eye-servants : they are however, upon the whole, the best class of field laborers. The usual monthly pay to good strong men is 3 to 3½ Spanish dollars per month, but those who have become expert at any particular work very soon discover their value, and cannot be kept without an increase of wages. Malays are to be had for dollars 2½ per month, and it is well to mix them with the Chinese ; in making sheds for trees and all work where the rattan is used, they are more expert, they are also more to be trusted, and are a very wholesome check upon the vagabond sons of Han. Patience and temper are eminently necessary to get on with the Malay ; they are not to be driven, but kindness and a little banter occasionally have excellent effect upon them. The Boyans are the most quiet, the most honest, and the most to be trusted of any of the races we see here ; they are very slow and not over-bright, but they perform their work as well in the absence of the overseer as before him, and they are by far the best nut gatherers. The Klings, or natives from the coast of Coromandel, are good workers if they choose to exert themselves, but they are the most wretched eye-servants, and seem to delight in chicanery of all sorts ; unlike the Malay, fear is the only motive capable of exciting them to action, and the application of the Mundoor's or Superintendent's rattan seems the only argument they understand ; they are chiefly valuable in taking care of horses or cattle, cutting grass and driving carts, all other work is better done by Chinese or Malays ; their wages is about the same as Chinese laborers, that is, from 3 to 3½ dollars per month.

Manuring, making sheds over young plants, and extirpating bad grasses, are works which had better be performed by the regular monthly laborers on the estate, and indeed so soon as a plantation comes into bearing all contract labor must cease, as by admitting strangers the facilities for robbery would be more than any supervision could frustrate. The number of men to be kept on an estate, to preserve it in first rate order, after it has come into bearing, must depend of course upon the size of the plantation, but in general one man for every 100 trees will be found sufficient, provided there be some 4 to 5 thousand trees. On a small scale the proportion must be greater, as the idlers, such as those who take care of and prepare the spice, gather the nuts, and manage the horses and carts, tell more upon a small than a large scale. A man by planting the Guinea grass and feeding cattle may make his own manure, and I believe it to be the best mode of proceeding ; those who depend upon the town for their supplies will frequently meet with disappointment and never obtain such good manure. The price of manure, generally speaking, is about 8 cart loads for the dollar, each cart containing 20 baskets. I conceive that two such carts, with a similar amount of burned earth, to be little enough manure for a tree of 12 years of age. It is almost impossible for a planter to manure the whole of his trees in the same season, if they amount to several thousands : in this case the best plan is to divide the pro-

perty into sections, manuring them in regular rotation, and to apply a few baskets of manure as top dressing to any particular trees that show symptoms of flagging.

The nutmeg planter is under the necessity of keeping up nurseries throughout the whole of his operations, for the replacement of bad plants and redundant males. Of the latter, ten per cent. seems to be about the best proportion to keep, but I would have completely Diœcious trees. No person can boast to get a plantation completely filled up and in perfect order much sooner than 15 years. Of the first batch planted, not more than one-half will turn out perfect females, for I do not take into account Monœcious trees which I have already condemned. The tree shows flower about the 7th year, but the longer it is before doing so, the better and stronger will it be. I cannot refrain from a smile when a sanguine planter informs me with exultation that he has obtained a nut from a tree only 3 or 4 years planted out,—so much the worse for his chance of success, too great precocity being incompatible with strength and longevity. The best trees do not show flower before the 9th year, and one such is worth a score of the others. This will be evident when it is stated that I have seen several trees yield more than ten thousand nuts each in one year, whereas I do not believe that there is a plantation in the Straits that averages 1000 from every tree. This very great disparity of bearing shows plainly that the cultivation of the plant is not yet thoroughly understood, or greater uniformity would prevail, and I think it clearly enough points out that a higher degree of cultivation would meet its reward. It is not quite safe to cut down the male plants upon first showing flower, as they many times show perfectly female flowers the following year, and in that case are generally the strongest and finest trees. But there is some indication of this in the first mode of flowering. When the racemes are many times divided and have numerous flowers, there is no chance of its becoming entirely female, but where there are only two or three flowers on a raceme there is a fair prospect of its doing so. The tree has not been introduced into the Straits sufficiently long to determine its longevity, but those introduced and planted in the beginning of the present century as yet show no symptoms of decay. The experiment of grafting the trees, which at first view presents so many advantages, both in securing the finest quality of nut and the certainty of the sex, has still to be tried in this cultivation. Some three years ago, I succeeded in grafting several plants by approach, these are not sufficiently old for me to decide whether it be desirable or not, for although the plants are looking well and growing, they as yet have thrown out their branches in a straggling irregular manner, having no leaders, and consequently they cannot throw their branches in the regular verticilos necessary for the perfect formation of the tree, without which they must ever be small and stunted, and consequently incapable of yielding any quantity of produce. The grafts have succeeded so far as stock and scion becoming one, and in

time a perpendicular shoot from the wood may appear. If after this it should increase in size and strength so as to form a tree of full dimensions, the advantage gained would be worth any trouble, the quality of some nuts being so far above that of others it would make a difference beyond present calculation; in short, 1000 such picked trees at the present prices would yield something equivalent to twenty thousand dollars per annum, for Sp. drs. 20 per tree would be a low estimate for such plants. If this ever does occur it will change the aspect of the cultivation altogether, and I see no good reason why it should not, except that those possessing trees of the quality alluded to, would not very willingly permit others to graft from them, so it is only the already successful planter who can try the experiment properly.

In addition to keeping the trees clean and free from moss and parasitical plants, it is highly desirable to use freely the pruning knife, cutting away all perpendicular shoots, the decayed ends of branches, or whenever the verticles are too close thinning them to admit air and sun to the centre. From overbearing, poverty of soil, or lodgement of water, it frequently happens that the top of the tree withers, and the whole of the plant will soon follow, unless it be cut down below the affected part; if this be done in time it generally saves the tree, which after a few months will throw a shoot from the hard wood of the stem to replace the former loss. Young plants are all the better for having the two or three first series of verticles cut off, otherwise the tree becomes too shrubby, and the lower branches touch the ground, excluding air, forming altogether a very inferior plant. This practice would however be unsafe in places like Penang affected by droughts, unless the plants be kept well shaded, until the upper verticles are sufficiently large to afford protection to the roots. As the tree bleeds freely upon being cut, the pruner ought to take along with him a pot of cement formed by boiling together two parts of pounded chalk and one of vegetable tar, which applied warm, stops the run of the sap, gradually hardens, and will remain on the cut part until it be quite healed. I have seen it stick on for several years, resisting all weathers.

Some trees from receiving too great a check are apt to overbear, and will soon wear themselves out if not watched and relieved of their superabundant fruit. This ought to be done so soon as the fruit forms, and if permitted to remain until three-fourths grown, the mischief is already effected, and cannot easily be remedied, but even should the tree not perish, the crop will scarcely be worth the gathering, so inferior will be the quality, and the tree unable to perfect its fruit, which splits ere the mace is red, and while the nut is soft and good for nothing. Unhappily some trees have a habit of splitting their fruit untimely, although their general appearance indicates strength and vigor. This is a fault for which as yet I know of no remedy; I attribute it to an original fault in the seed, and if this be correct, I fear it admits of none.

The planter having his tree arrived at the agreeable point of producing has but slight trouble in preparing his produce for market. As the fruit is brought in by the gatherers, the mace is carefully removed, pressed together, and flattened on a board, exposed to the sun for three or four days, it is then dry enough to be put by in the spice house until required for exportation, when it is to be screwed into boxes and becomes the mace of commerce. The nutmeg itself requires more care in its curing, it being necessary to have it well and carefully dried ere the outer black shell be broken. For this purpose the usual practice is to subject it for a couple of months to the smoke of slow fires kept up underneath, whilst the nuts are spread on a grating about eight feet above. I myself prefer one raised fully 10 feet, but the model of a perfect drying-house is easily obtained, and the process is too well known to require any further explanation. The only caution I would give is, that planters ought to take care and not dry their nuts by too great a heat as they shrivel and lose their full and marketable appearance; for this purpose I think it desirable to keep the nuts, when first collected, for eight or ten days out of the drying-house, exposing them at first to an hour or so of morning sun, and increasing the exposure daily until they shake in the shell; the nuts ought never to be cracked until required for exportation, or they will be attacked and destroyed by a small weevil-like insect, the larvæ of which is deposited in the ovule, and, becoming the perfect insect, eats its way out, leaving the nut bored through and through, and worthless as a marketable commodity. Lining the nuts prevents this to a certain extent, but limed nuts are not those best liked in the English market, whereas they are preferred in that state in the United States. When the nuts are to be lined it is simply necessary to have them well rubbed over between the hands with powdered lime. I am given to understand that they are steeped in a mixture of lime and water for several weeks by the Dutch mode of preparation. This no doubt will preserve them, but doubtless it must also have a prejudicial effect on the flavor of the spice. After the nuts are thoroughly dried, which requires from six weeks to two months' smoking, they cannot be too soon sent to market. But it is otherwise with the mace, that commodity when fresh not being in esteem in the London market, seeing that they desire it of a golden color, which it only assumes after a few months, whereas at first when fresh it is blood-red; now red blades are looked upon with suspicion, and are highly injurious to the sale of the article. This is one of those peculiar prejudices of John Bull, which somewhat impugns his wisdom, but must be attended to, as John is ever ready to pay for his caprice; therefore those who provide for him have no right to complain although they may smile.

Through the kindness of the Resident Councillor, I have been furnished with the following correspondence and statistics* which show, that the nutmeg

* We have not thought it necessary to reprint these. — *Eds. Journal A. and H. S.*

tree was sent from Bencoolen to Singapore the latter end of 1819, so that twenty nine years have elapsed since its first introduction. Some of the plants alluded to in Sir Stamford Raffles' letter were set out at the foot of Government Hill in neither a bad soil nor locality, and several of them are at present and have been for the last ten years fine fruitful trees. Table No. 1 shows that 315 trees in this garden yielded last year 190,426 nuts, or at the average of 604 for each tree, but of the 315 bearing trees mentioned in the table not over fifty are of the old stock, most having been planted since 1836, so that a planter may safely calculate on having a better average than is here set forth, provided he attends to his cultivation and his trees are brought up to the age of 15 years. If a plantation be attended to from the commencement, after the manner I have endeavoured to explain, and the trees be in a good locality, the planter will undoubtedly obtain, an average of 10 lbs. of spice from each tree from the 15th year. This at an average price of 2s. 6d. per lb. is 25 shillings per annum. He can have about 70 such trees in an acre, so that there is scarcely any better or more remunerative cultivation when once established, but the race is a long one, the chances of life, a high rate of interest in this country make it one of no ordinary risk, and it is one that holds out no prospect of any return in less than 10 years. A person commencing and stopping short of the bearing point either by death or want of funds will suffer almost total loss, for the value of such a property brought into a market where there are no buyers must be merely nominal. Again, if the property has arrived at the paying point, almost any person of common honesty can take charge of and carry it on, for the trees after 12 years are remarkably hardy and bear a deal of ill treatment and neglect; not that I would recommend any person to try the experiment, but it is some consolation for the proprietor to know that stupidity will not ruin him, and that even at the distance of thousands of miles he can give such directions as, if attended to, will keep his estate in a flourishing and fruitful state.

I have now set the pros and cons of nutmeg cultivation before the reader. Should he like to try the experiment there is ample scope and verge enough for him in Singapore. He need not be afraid of failure if he proceeds with energy and perseverance. The cultivation is rapidly extending, and I fear the prices are falling. Should the Moluccas be thrown open, I cannot answer for how much greater may be the depreciation in value, but a produce that requires 15 years to bring it to market in remunerative abundance is not so easily overdone. The tree is not more quickly productive in the island of Banda than in the Straits, and, as I have before said, neither do they excel us in relative quantity or quality. Those who have established plantations may laugh at the bugbear of over-production, and rest content even with some further reduction in prices.*

The consumption is increasing and likely to increase in the United States, and no doubt, were the heavy duty exacted in England lightened, the consumption would also increase in Great Britain. At present the duty is above the value of the article, which is any thing but encouragement to our eastern colonies, and is hardly fair, considering that the differential duties have been done away with, and that we have to compete on equal terms with our monopolizing neighbours the Dutch, who take very good care to make no reciprocation in favor of British commerce.—*Journal of the Indian Archipelago*, for October, 1848.

NEMOPHILA MACULATA.

NEMOPHILA MACULATA, *Bentham* (spotted-flowered *Nemophila*).—Hydrophyllaceæ.

This is said to be the best of the annual plants collected by Mr. Hartweg, during his recent mission to California in search of new plants for the Horticultural Society. Mr. Hartweg gave it the name of *N. speciosa*, a title which has been rejected on account of its "inappropriateness," and Mr. Bentham has given it that which stands at the head of this article, but which is not, by the way, a very distinctive one, inasmuch as one of the commonly cultivated species *N. atomaria* has its flowers spotted all over with little dark-colored dots.

Nemophila maculata is an annual plant, of a procumbent habit, like that of the well-known *N. insignis*, and the whole plant is clothed with short spreading hairs. The lower leaves are lyrate-pinnatifid, the lobes being short, obtuse, and somewhat falcate, and the upper ones wedge-shaped and three-lobed. The flowers grow from the axils singly, on stalks longer than the leaves, and are about the size of those of the large variety of *N. insignis*, whitish in their ground color, and each lobe of the corolla tipped with a large deep-violet blotch, which, when perfect, gives the flower a showy and rather peculiar appearance. This plant attains about the same size as does its congener just mentioned, and produces its blossoms freely, so that it will prove both useful and ornamental under cultivation.

There is one circumstance which has been observed respecting it, that may be regarded as an objection; the colors are liable to sport and vary. Sometimes the flowers are veined, the veins being of a pale blue color, thus spoiling their purity; at other times the spots are ill-defined, pale, and even sometimes run, by which the flowers lose their distinctness. To retain the species, therefore, in its beauty, the seeds must be saved from the more perfect only of the blossoms, or those in which the colors are pure and distinct; and from among these, those with indistinct, pale, or run colors, should, as far as possible, be removed as soon as they show themselves. It is the clear and deep-colored, well-defined spotting which gives to the true kinds its beauty; the indistinctly marked plants being in every way inferior.

No difficulty occurs in its cultivation, which should be made to accord with that of the other species, which are by this time familiar objects in most gardens. As an annual it will rank in the hardy class, growing well in any good garden soil, and perfecting seeds by which it may be continued from year to year. These seeds may be sown either in the open border, at different periods for a succession of blooming plants, or the earlier plants may be reared in pots or boxes in a frame, and transplanted into the open ground in April or May. Whether it would survive the winter if sown in the autumn, as *N. insignis* does in dry warm situations, we have had no opportunity of knowing; but coming from the same country, California, the probability is that it would, and if so, a portion should be sown in this way for blooming early in the spring.

Though an interesting, and when perfectly true, a pretty plant, it is by no means so ornamental or effective as *N. insignis*, owing to the absence of distinctive coloring, which in the latter species, apart from its other beauties, renders it a particular and universal favorite.—*Horticultural Magazine*, for December, 1848.

Monthly Proceedings of the Society.

(Thursday, the 14th September, 1848.)

William Storm, Esq., Vice-President, in the chair.

Elections.

Messrs. R. Ince, Wm. Thomson, and Robert Stopford ; Baboos Rajajudur Dutt and Ramapersaud Roy.

Proposals.

Captain O. Cavenagh, Superintendent Mysore Princes,—proposed by Lieut. N. A. Staples, seconded by Dr. Strong ;

Hercules Scott, Esq., C. S., Deputy Officiating Commissioner, Jullundur,—proposed by Captain F. C. Burnett, seconded by Dr. Huffnagle ;

Lieut. G. E. Voyle, Artillery, Jullundur,—proposed by Captain Burnett, seconded by Dr. Huffnagle ;

W. B. Buckle, Esq., C. S., Midnapore,—proposed by Mr. H. T. Raikes, seconded by the Secretary ;

R. T. Larmour, Esq., Delowry factory, Pubna,—proposed by Mr. J. J. Gray, seconded by Mr. J. W. Laidlay ;

G. N. Wyatt, Esq., Peepra factory, Champaran,—proposed by Mr. Ewen McDonell, seconded by the Secretary ;

T. M. Robinson, Esq., Merchant, Calcutta,—proposed by Mr. C. G. Mansel, seconded by the Secretary.

Presentations to Library.

1. Madras Journal of Literature and Science, No. 23. *Presented by the Society.*

2. Journal of the Asiatic Society, Nos. 191 and 192. *Presented by the Society.*

3. Journal of the Indian Archipelago, for June, July and August, 1848. *Presented by the Editor.*

4. Two copies of the same work, for the same period. *Presented by the Govt. of Bengal.*

5. A brief Manual of Gardening for the Deccan, by Dr. R. Riddell. *Presented by the Author.*

Garden and Museum.

1. A quantity of peach stones from trees growing in his garden at Gowhatti. *Presented by Dr. K. M. Scott.*

Dr. Scott mentions, that these peach stones belong to the fruit to which allusion is made in his letter read at the July meeting ; very few of which weighed less than 12 and 14 tolahs, and the largest upwards of 20 tolahs each.

2. A variety of plum (*Prunus triflora* ?) grafted on the peach ; with fruit of the same ; and of two other sorts of plums, all raised in his garden. *Presented by Dr. Scott.*

Dr. Scott states, that the first-named plum, never ripens thoroughly at Gowhatti, but makes an excellent tart ; he obtained the original plant from Jaipore, Upper Assam, but knows not how it got there.

The Secretary, in reference to the above, drew attention to the following description by Roxburgh of *Prunus triflora*, the "*Hung-sum-li*" of the Chinese :—

"This elegant, very rumous bushy shrub, has been received from China, into our gardens in Bengal, where it blossoms in February, immediately after which the luxuriant foliage expands, and the fruit, which is about the size of the common plum, and nearly as palatable, ripens in May and June."

One of the other two kinds of plum may be the *Prunus silvatica*, Roxb. stated by him to be "a native of Deyrah Dhoon, Sirmoor, Mountains of Hindoostan." Dr. Scott adds, that both these sorts—yellow and purple, are alike in one respect, namely, that they never ripen to be eatable without cooking ; but they come in for tarts just after the finer kinds go out.

3. A few raspberries, the produce of plants raised from English seed supplied to him two years ago by the Society. *Presented by Col. Ouseley.*

The Secretary mentioned, that the fruit had not reached in good order ; but the seed had been sown in the Society's garden.

4. Seven fine Bombay mango grafts. *Presented by Major Napleton.*

5. A quantity of the leaves of *Andrackne trifoliata*, Roxb. : *Sytoldiscus trifoliatus*, Voigt : and several pieces of woollen and linen cloth and silk dyed by an infusion of the leaves. *Presented by Major Jenkins.*

Major Jenkins remarks, that "this tree is rather scarce at Gowhatti, but in Central Assam—about Sibsaugor—it is very common, and furnishes the hard red posts usually employed in the erection of all buildings. Mr. Grose, who sends me these specimens, has favored me with no particulars about the management of the dye ; but I suppose any practised dyer will obtain the same results as he has, and by using other mordants than his (which was an acetate of iron) may produce other useful colors. The black might be made a clearer and finer color perhaps by first dyeing the cloths with indigo. Should the dye appear to be of any value, it may be obtained very cheaply, for the trees are very large, and carry a very thick foliage."

The matter was referred, at the suggestion of the Secretary, to Mr. Laidlay, who was solicited to test these leaves, and communicate the results to the Society.

6. A small bag of "*Riz Creole*" (Creole rice) from Mauritius. *Presented by H. Piddington, Esq.*

Mr. Piddington mentions, that should any member desire to attend particularly to this product he can spare him a little more seed. Mr. Piddington also draws attention to the following brief notice, inserted in Vol. iii. of the Society's transactions, in allusion to the same description of rice, presented by him in 1836 :—"The accompanying small parcel of rice is from the Mauritius, where it is known under the name of *Riz Creole*, and is considered as a great delicacy amongst the inhabitants. I believe it to be a choice species originally from Madagascar. It requires water like the *Roao Dhaun* (or planted rice) of Bengal, and it may prove here a valuable sort."

The Secretary brought to the notice of the meeting a small quantity of Creole rice (from the various specimens of grain in the Society's Museum), which had been raised at Gowhatti from the supply formerly presented by Mr. Piddington. This sample was sent to the Society by Major Jenkins in May 1837. It appears somewhat changed in character from the original stock, as compared with the grain last received from Mr. Piddington.

Cotton-cleaning Machines.

The Secretary having drawn the attention of the members to four cotton-cleaning machines which had been erected in the Society's large hall, it was agreed, that the Special Committee appointed at the February meeting, be requested to meet on Saturday afternoon, the 23rd instant, for the purpose of inspecting and reporting on the working of such machines as may be entered for competition for the Society's prize. Further, that Mr. Edward Smith, late a cotton-spinner in Manchester, and Mr. Marshall, Secretary to the Fort Gloster Company, be also invited to attend to afford the committee the benefit of their opinion on the cotton cleaned by the several machines.

At the suggestion of the Secretary it was also resolved, that as Mr. Burn of Edinburgh, had not appointed any representative in Calcutta, Mr. Fraser, Assistant to the Consulting Engineer to the Government of India, be solicited to superintend the adjustment and working of the machine lately received by the Society from that gentleman.

Defaulters to the Society.

The Finance Committee, by virtue of the authority vested in them, submitted for publication the names of the five following members, as defaulters to the Society, preparatory to their withdrawal from the list :—viz^d

Defaulters under the Resolution agreed to at a meeting on the 16th Sept. 1842 ;—"that the Finance Committee have the power to revise from time to time the list of subscriptions in arrear, and that they be empowered to pub-

lish periodically the names of those defaulters, the recovery of whose subscriptions is hopeless :”—

Baboo Kissubchunder Roy, of Nuddea, for subscription unpaid during five years ; Col. Andrew Hervey, Mr. Charles Chapman, C.S., Baboo Goureyper-saud Roy of Kungpore, and Baboo Rajbullub Seal of Calcutta ; each for subscription unpaid during four years.

Communications on various subjects.

The following letters were also read :—

1. From Dr. K. M. Scott, describing his mode of treating the peach tree.
2. From Dr. Falconer, on the subject of the “*Pooah*” plant of Darjeeling, of which a flowering specimen has been sent down by Dr. Campbell, and the fibre of which has already been so favorably reported on to the Society. Dr. Falconer adds a minute description of the plant.

3. From Captain Latter, forwarding a printed extract of a Report on the Teak forests in the Tenasserim Provinces ; also a very well executed map of the Thoungyeen and Attran forests, on the northern boundary of those provinces.

These three communications were referred to the Committee of Papers.

4. From W. Seton Karr, Esq., Under-Secretary to Government of Bengal, transmitting copy of a letter from the Government of Ceylon, in which an application is made for seed of American *Sumach*.

The Secretary mentioned, that he had forwarded all the seed in store.

5. From E. E. Woodcock, Esq., Beerbhoom, intimating that the Carolina paddy, maize, and other seeds sent by the Society for the public garden at that station, have germinated most readily.

6. From Baboo Terrucknath Roy, Maunbhoom, submitting a further portion of his Bengallee translation of Fenwick’s Hand-book of Gardening.

7. From Monsieur L. Bouton, Secretary Royal Society of Arts and Sciences, Mauritius, applying for seed of Cabool capsicum, *Teree* of Chittagong, Tenasserim yams, &c. &c.

The Secretary stated, that he had taken steps to meet this application.

8. From C. T. Smith, Esq., Surgeon Mysore Commission, Bangalore, requesting to be informed if Signor Mutti’s system of rearing the standard mulberry for silk culture has been tried in Bengal, and with what success. States, that it has proved a failure in the Mysore country.

The Secretary mentioned, that the result of his enquiries showed it to have been equally unsuccessful here.

9. From Mr. James Carter, Seedsman, London, intimating his intention of dispatching by the August Steamer, the consignment of flower seeds ordered by the Society.

10. From Messrs. Villet and Son, Cape of Good Hope, forwarding invoice of vegetable seeds, shipped per *Greenlaw*, amounting to Rs. 1,315.

The Secretary mentioned, that the above vessel having been wrecked off Coringa, he had lost no time, on receipt of this advice, in purchasing from the Agent of the Bhaugulpore Branch Society, as many packets of acclimated vegetable seeds as were available, and had distributed them in place of the lost consignment.

Before the members separated it was agreed, that the next general meeting be held on Wednesday, the 18th October, as the holiday would interfere with its taking place on the second Thursday of the month, the day on which these meetings are usually held.

(Wednesday, the 18th October, 1848.)

The Hon'ble Sir Lawrence Peel, President, in the chair.

Elections.

Capt. Cavenagh ; Lieut. G. E. Voyle ; Messrs. W. B. Buckle, C. S. ; R. T. Larmour ; G. N. Wyatt ; Hercules Scott, C. S., and T. M. Robinson.

Proposals.

The Hon'ble D. Bethune,—proposed by the Secretary, seconded by Dr. Hufnagle ;

Edward Lushington, Esq., C. S.,—proposed by Sir L. Peel, seconded by the Secretary ;

Lieut. E. T. Dalton, (9th Regt. N. I.,) Principal Asst. Commr. of Assam,—proposed by Major Jenkins, seconded by the Secretary ;

A. W. Glass, Esq., Merchant, Calcutta,—proposed by Baboo Ramgopaul Ghose, seconded by Baboo Peary Chand'Mittra ;

Baboo Prawnkissen Law, Merchant,—proposed by Baboo R. G. Ghose, seconded by Baboo P. C. Mittra ;

Arbuthnot Emerson, Esq., Supt. Peninsular and Oriental Company,—proposed by the Secretary, seconded by Dr. Hufnagle ;

B. Wood, Esq., Deputy Magistrate, Santipore,—proposed by Mr. W. G. Rose, seconded by Mr. W. Storm ;

C. E. Morton, Esq., Dagatchee factory, Malda,—proposed by Mr. J. J. Gray, seconded by the Secretary ;

Capt. W. Jervis, (42nd Regt. N. I.,)—proposed by Dr. Strong, seconded by the Secretary.

Presentations to Library.

1. Statistics of British East India Sugar (12 copies). *Presented by the Government of India.*

2. Journal of the Asiatic Society of Bengal, Nos. 193 and 194, and Supplementary number for June, 1848. *Presented by the Society.*

3. Johnson's Dictionary of Modern Gardening, edited by David Landreth. *Presented by the Editor.*

Garden and Museum.

1. A quantity of tea seed, gathered from China plants in his garden at Burkaghur, Chota Nagpore. *Presented by Col. Ouseley.*

2. A small supply of *Narcissus* bulbs, from the public garden at Lucknow. *Presented by Capt. G. E. Hollings.*

Capt. Hollings states, that in compliance with the request of the Society, he has sent an assortment of seeds of various kinds for the use of the State gardens in the Punjaub.

3. Four boxes of cereal grains, consisting of Chiddam wheat, Chevalier barley, and potato oats, from the India House. *Forwarded by the Precursor steamer.*

4. A quantity of vine cuttings and a few fig trees from the Cape of Good Hope. *Presented by C. T. Juritz, Esq., H. D. M. Consul, at the Cape.*

5. Cloth made from sunn fibre, by the Allipore jail prisoners. *Presented by Mr. J. Floyd.*

6. Specimens of cow-hide and calf-skin tanned with *Terec* pods, forwarded by Mr. Seonce from Chittagong; and a bottle of dye-stuff from the same pods. *Presented by Mr. John Teil.*

The minutes of the Committee appointed to examine and report on Baboo Tarrucknath Roy's translation into Bengalee of Fenwick's Urdu Hand-book of Gardening were read. After some discussion it was agreed, that preparatory to taking any further steps in the matter, Mr. Fenwick be requested to oblige the Society with a version of his work in English.

A schedule of prizes for the next flower-show, to be held on 28th October, was submitted. It was agreed, that Dr. Falconer, Colonel Sage, and Dr. McClelland be requested to act as judges.

Communications on various subjects.

The following letters were also submitted :—

1. From Dr. Macgowan, dated Ningpo, June 1st, affording some interesting information regarding the plants which yield the "grass-cloth" of China. Dr. Macgowan enters into particulars regarding the description and history of these plants, their medical properties, mode of culture, and the various after-processes adopted by the Chinese for preparing the fibre, bleaching it, &c., &c.

2. From John Teil, Esq., detailing the results of certain further tanning experiments on a more extended scale than that reported on last year, with the large supply of *Tere* pods, forwarded by Mr. Sconce from Chittagong in May last.

The best thanks of the Society were accorded to Dr. Macgowan and Mr. Teil for their useful communications, which were referred to the Committee of Papers.

3. From Major Napleton, Secretary Bhaugleporé Branch Society, applying for the usual annual donation from the Parent Society, and for any further pecuniary aid the Society may be disposed to grant.

4. From E. E. Woodcock, Esq., acknowledging the receipt of a further supply of seed from the Society (wheat, maize, white linseed, vegetable and flower), for the use of the public garden at Soory. Mr. Woodcock mentions, that the Carolina paddy has turned out admirably; and asks for Otaheite cane.

5. From Dr. Campbell, Darjeeling, requesting to be furnished with forty copies of Fenwick's Hand-book of Gardening, as he thinks that number may be disposed of at the Titalya fair.

6. From Mr. James Carter, Seedsman, London, dated 19th August, advising the dispatch of the invoice of flower seeds ordered by the Society, and stating that the fruit stones and *dahlia* bulbs will be dispatched by the September steamer.

(Thursday, the 9th November, 1848.)

The Honorable Sir Lawrence Peel, President, in the chair.

Elections.

The Honorable D. Bethune; Lieutenant E. T. Dalton; Messrs. Edward Lushington, C. S.; A. W. Glass; Arbuthnot Emerson; B. Wood; C. E. Morton; Baboo Prawnkissen Law, and Capt. W. Jervis.

Proposals.

John Leslie Russell, Esq., Merchant,—proposed by Mr. W. F. Ferguson, seconded by the Secretary;

Thomas Wilson, Esq., Depy. Opium Agent, Ghazee-pore,—proposed by Mr. Alexander Wallace, seconded by Dr. Huffleagle.

Presentations to Garden and Museum.

The following presentations were announced:—

1. A quantity of acclimated China tea seed, from the Himalaya. Presented by Dr. Jameson, Superintendent Botanic Gardens, N. W. Provinces.

2. A further supply of *Tere* pods from Chittagong. Presented by Mr. Sconce, S. C.

3. A quart of acclimated mignonette seed. Presented by Mr. P. Rayson.

4. A fine healthy plant of *Cordea Sebestena*. Presented by Mr. R. Wood, Junr.

[The tea and mignonette seed are available to members.]

The Secretary placed on the table some fruits—pippins, pears, nuts, &c., which had been forwarded to him from Jersey by Col. Davidson, formerly of the Bengal Engineers, secured in plaster of Paris, an experiment at preservation which had succeeded well on the Island. It was evident on breaking the plaster, that with the exception of the nuts, which were in good order, the experiment had failed.

A list of the plants to which prizes were awarded at the third quarterly flower show, held on the 28th of October, was submitted, and the following remarks were read :—

“It will be seen from the list now submitted, that only Rs. 89, or one-half the sum noted in the printed schedule, were distributed on this occasion. In consequence of their general inferiority, several specimens were not deemed worthy of prizes, and a few sorts that were included in the schedule were not forthcoming. A portion of the amount thus left available was awarded to *extra* plants, the names of which are detailed at the end of the list.

“Among the plants most deserving of notice may be enumerated a few well grown *Achimenes grandiflora* (though late in the season), *Rondeletias*, *Limonia spectabilis*, *Parsonsia corymbosa*, *Sprekelia formosissima* (in fine flower for this time of the year), *Solidago canadensis*, a well-flowered plant of double *Zinnia*, and a few *Orchids*, viz. : *Bletia verecunda*, *Vanda Roxburghii*, *Pogonia*, &c. The collection of *Malpighias*, *Thunbergias*, *Coreopsis* (in which was a handsome new variety), and *Xylophyllas*, was tolerably good. The *Passifloras*, *Solanums* and *Aristolochias* were indifferent, the season for them having almost passed away. The *Phloxes*, *Verbenas*, *Pinks*, and *Roses* were also poorly represented ; but of these a better collection may be anticipated at the December show.

“Notwithstanding the inferiority of this exhibition,—which indeed was to be anticipated in consequence of the excessive heat and drought in September, and the heavy falls of rain during the second week of October,—it may be considered, as regards the variety of specimens brought forward, an improvement on the third quarterly show of last year, which was held, also, on the same day of the same month. The competition too was rather more spirited, prizes being awarded to the produce of 16 gardens.

“Dr. Falconer, Col. Sage, and Dr. McClelland officiated as judges, and Sir Lawrence Peel awarded the prizes.”

In connection with the above, the Secretary brought to the notice of the meeting the following recommendations from the judges for the better management of future exhibitions :—

“ The judges of the late flower show, submit to the Society, that they found much of their time wasted in walking up and down the Hall to examine specimens, or collections, of the same flowers which, belonging to different individuals, were at the extreme ends of the rooms, causing not only delay, but incapacitating the judges from forming perfect ideas of the qualities and growth of the plants which, to be correctly judged, should have been placed in juxtaposition. It has occurred to them, that the following rules, if adopted, would not only obviate the delay, and inconvenience now felt, but would tend ultimately to give satisfaction to those who exhibit their flowers and plants at the quarterly shows, and to the public who attend the exhibitions :—

1. All flowers, plants, &c. to be arranged as set down in the prize lists.
2. Every flower pot, or tub, to be labelled, showing the names of the owner and of the plant.
3. When the plants and flowers are arranged, the mallees and all parties not attending the judges, to be excluded, until the prizes are adjudged.
4. The judges to be provided with cards, or bits of wood, attached to pegs, and labelled according to the prize lists, as ‘ first prize collection,’ ‘ 2nd prize specimen,’ &c. These will be stuck in the flower pot where the prize has been given, and will be recognized by the parties concerned, and produced to the distributor of the prizes, without the labor and confusion of removing the plants, &c.

October 30th, 1848.”

Resolved,—That the judges be informed that the Society are willing to adopt their recommendations, and that they be requested to have them carried out at future exhibitions.

The Report of the Special Committee appointed to inspect and report on the several cotton machines entered to compete for the gold medal and prize offered by the Society and Major Jenkins, the Commissioner of Assam, for an improvement on the Indian *Churka*, was next submitted. The document being of considerable length, and interspersed with tabular statements, it was deemed expedient to defer the consideration of it to the next general meeting; the Secretary being requested to have it printed and circulated, in the meantime, to all the resident members. It was also agreed that, in accordance with the suggestion of the Committee, a copy of the Report should be sent to Major Jenkins for his decision in regard to the premium offered by that gentleman. It was further resolved, that the best thanks of the Society be given to Mr. Simms, the Chairman, and to the other members of the Committee, for the care and attention they have devoted to the subject of their enquiry: also to Messrs. Edward Smith and Henry

Marshall, for their reports on the cotton submitted for their examination, and to Messrs. John Fraser and J. H. Mather, Civil Engineers, for their assistance generally in the arrangement of the machines.

The Honorary Secretary read the concluding passage of the Report conveying the thanks of the Committee to the Assistant Secretary for his attention and assistance throughout their proceedings, and said, he considered it due to himself to observe, that as Honorary Secretary of the Society, he had attended the Committee at its first sitting, and that he had never heard directly or indirectly of or from the Committee afterwards, until the Report was forwarded to him the previous day. He desired to say so much, and that he was not informed of their meetings, to protect himself from the possible suspicion of having been wanting in attention to them.

Dr. Hufnagle, a member of the Committee, observed, that in the passage read, there was not the slightest intention to reflect upon the Honorary Secretary.

The Deputy Secretary explained that the blame rested entirely with himself, as he had inadvertently omitted to forward the several circulars to the Honorary Secretary, who was *ex-officio* a member of the Committee.

Read a letter from Major McNair, Offg. Durbar Chief Engineer, Lahore, intimating the receipt of a second supply of seeds (vegetable and flower, maize, cotton, and cereal grains) for the use of the State gardens of the Punjab, and promising to give his best attention to their cultivation.

A note from Thomas Watkins, Esq., of Katsooly, was also read. Mr. Watkins encloses a printed paper on the cultivation of Guinea grass, extracted from Fitzmaurice's *Treatise on Sugar-cane Cultivation, &c.*, and suggests that it be re-printed in the Society's Journal. Referred to the Committee of Papers.

(Friday, the 18th December, 1848.)

William Storm, Esq., Vice-President, in the chair.

A note was read from the Honorable the President, expressive of his regret at not being able to attend the meeting from indisposition.

Elections.

John Leslie Russell, Esq., and Thomas Wilson, Esq.

Proposals.

Lieut. Charles Holroyd (36th N. I.), Junior Assistant Commissioner of Assam,—proposed by Major Jenkins, seconded by the Secretary;

William Cockburn, Esq., Deputy Magistrate, Maggroo,—proposed by Mr. Henry G. French, seconded by the Secretary;

Baboo Joy Gopaul Bysack,—proposed by Baboo Peary Chand Mittra, seconded by Baboo Ramgopaul Ghose;

Captain Commandant P. M. Taylor, H. H. the Nizam's Army,—proposed by Captain James Johnston, seconded by the Secretary;

Rt. H. S. Campbell, Esq., Civil Service,—proposed by Dr. Strong, seconded by the Secretary;

• Baboo Gobind Chunder Sen,—proposed by Mr. W. G. Rose, seconded by Baboo Ramgopaul Ghose.

Presentations.

1. Journal of the Indian Archipelago for September and October 1848. *Presented by the Editor.*

2. Two copies of the same work, for the same period. *Presented by the Government of Bengal.*

3. Specimens of clarified oil of the *Mowah* nut (*Bassia latifolia*), and of soap and candles made therefrom. *Presented by the Society of Arts.*

4. A quantity, (half a hundred-weight) of pods of the Carob tree (*Ceratonia siliqua*). *Presented by Dr. Henry Abbott, of Cairo.*

The Secretary reminded the members, that this seed had been procured for the use of the State gardens of the Punjaub, in accordance with a suggestion made by Dr. Falconer, at the July meeting.

5. A sample of *kuppas*, the produce of his garden at Burkaghur, (Chota Nagpore,) raised from acclimated Mexican cotton seed, gathered at the Coimbatore farms and received from Dr. Wight in June last. *Presented by Colonel Ouseley.*

Colonel Ouseley mentions, that the seed was sown late in July, in not very fine soil, and the plants were not irrigated. The height of the bushes is from 3 to 4½ feet, and the number of pods on each bush averages 36. "The cotton," adds Colonel Ouseley, "is very white, and staple long and fine. I had a space about 70 yards square sown, and all the seed, (one seer) germinated excellently. Dr. Wight calls it Mexican cotton. I am of opinion, that it is a species of cotton that will answer perfectly on this high table-land."

Dr. Hufnagle considered the above cotton to be similar to the Upland Georgia variety, of equally fine but rather shorter staple. It is a good deal stained, a fault in the gathering, which might be corrected by a little care.

6. Specimen of the same description of cotton raised in the Society's garden from the same batch of seed, was also placed on the table.

7. Dr. Hufnagle presented two very well executed casts of pears, taken from the plaster of Paris mould, in which the fresh fruit sent from Jersey by

Colonel Davidson, of the Engineers (and presented at the last meeting), had been embedded.

Exhibition of Vegetables and Fruits.

A list of gardeners to whom prizes were awarded at the horticultural exhibition, held on the 6th of December, was submitted, and the following remarks were read :—

“Considering the general backwardness of the season, there was a tolerably good display of esculents of all sorts. Cauliflowers, turnips, nolo-kole, sugar loaf cabbage, and lettuce, were well represented, and—for the time of year—asparagus and colery; some specimens of the former were well grown, showing a decided improvement on last year's stock. Peas of the blue Prussian and other kinds, beans, including the scarlet runner, endive (well blanched), beet and carrots were submitted for competition; also brocoli, kale, water-cress, leek, and horse-radish.

“Though the fruit department offered but little variety, there were several good baskets of pomegranate, pine-apple, oranges (grown in the neighbourhood of Calcutta), custard-apples, plantains, and a very fine collection of sapotas from a garden at Howrah.

“Altogether, it may be assumed, that though the quantity was probably smaller than that brought forward at the December show of last year, the specimens were of equally good, if not better quality.

“The specimens were selected by Messrs. Rose, Speede and Baboo Peary Chand Mitra (Members of the Committee), and the prizes, amounting to Rs. 135, were distributed to 66 gardeners, by William Storm, Esq., V. P.”

Nursery Garden.

A Report was read from the Garden Committee regarding the present state of the nursery. The Committee allude to the completion, at a cost of Rs. 175, of the boundary ditch, which has been made sufficiently broad and deep to protect the garden against the inroad of men and cattle. They state, that they have reduced the cane plantation to a beegah of ground, (merely to retain a small stock of each sort of cane) in consequence of there having been no demand this season for cuttings. They refer to the excellent state of the orchard department, (consisting of 8 beegahs,) especially of the mango grafts, and state, that they have given directions to fill up 4 more beegahs with grafts and plants of the best descriptions of loquat, wampee, peach, litchie, &c., for future distribution to members. They mention that the kitchen garden, of 6 beegahs, has been fully laid out with vegetables of sorts, especially with peas, cauliflowers, carrots and turnips, with the view of raising seed for

distribution next year : and close their report with certain recommendations for the improvement and greater utility of the flower garden.

The Report was confirmed in all its details.

Award of a gold Medal and 500 Rupees to Mr. Mather, for his improved cotton-cleaning Machine.

The Report of the Committee upon the cotton-cleaning machines, which was presented at the last general meeting, and ordered to be printed and circulated for the information of resident members, previous to its final disposal at the present meeting, was next brought to notice. The Secretary mentioned, that this Report, as regarded its various details, having been formally received at the last meeting, all that he believed was necessary on the present occasion, was to dispose of the subject matter contained in the 10th paragraph, the Committee having left that to Major Jenkins and the Society to determine ; namely, the award of the gold medal and sum of five hundred rupees. But before entering upon this question he begged to draw their attention to a few observations from Col. Sage, on Mr. Mornay's dissentient minute, which had not been penned in time to be incorporated in the pamphlet circulated last month.

The remarks having been read, the Secretary next submitted the following communication from Major Jenkins, to whom, in accordance with the recommendation of the Committee, a copy of the Report had been forwarded:—

Gowhatty: 28th November, 1848.

"MY DEAR SIR,—I have to acknowledge the receipt of your favor of the 17th, and beg to inform you, that I am quite content that my prize should be disposed of in any manner the Society deem proper, and be awarded to Mr. Mather should the Society approve.

"No cotton-cleaning machine, that is entirely worked by manual labor, will answer the object proposed, but I imagine Mr. Mather's cotton-cleaner can be applied to machinery, and be worked by horse or steam-power—and if this be the case, the invention, with the improvements that may hereafter be made upon it, may be of the greatest importance to Indian cotton-growers. With merely the native *churka* it seemed impossible for us to compete with America, where the whole of the cotton is cleaned by machinery.

"JAS. HUME, ESQ.

FRANCIS JENKINS."

After the perusal of the above letter and a short discussion, it was proposed by Col. Sage, seconded by Mr. Staunton, and carried,—“That the gold medal and sum of 500 Rs. be awarded to Mr. Mather, for the improvement in the turning out of the cotton cleaned by his machine.”

Communications on various subjects.

1. From S. R. Davenport, Esq., Secretary to the Society of Arts, transmitting a favorable report on the *Morah* oil forwarded last year, with specimens of soap and candles made therefrom.

2. From S. H. Robinson, Esq., recommending a re-print in the Society's Journal of a work published in 1793, but now out of print, entitled "A Treatise on the Culture and Manufacture of Sugar in India," by W. Fitzmaurice; and offering his services to add a few marginal notes thereto, to aid in the elucidation of the system proposed by the author.

3. From Major Napleton, Honorary Secretary of the Branch Agri-Horticultural Society, Bhauglepora, forwarding an account of an exhibition of vegetables, fruits and flowers, held on the 27th November last.

These three communications were referred to the Committee of Papers.

4. From H. V. Bayley, Esq., dated London, 19th August, requesting information regarding the Agricultural Society, its history, rules and operations, for his proposed revised work of the nature of his Bengal and Agra Guide and Gazetteer.

The Secretary proposed, with the sanction of the Society, to afford the information required.—Agreed.

5. From Arbuthnot Emerson, Esq., suggesting an interchange of correspondence, seeds, &c., with the Belfast Royal Botanical Society, and the Ulster Horticultural Society, in both which Institutions he is much interested.

The Secretary mentioned that, anticipating the concurrence of the Society, he had, as a beginning, transferred a small assortment of Himalayan seeds, cedar, pine, cypress, &c., to Mr. Emerson, for dispatch by the steamer which had just left.

6. From Mr. H. Fenwick, intimating, that he is not prepared to meet the Society's request for a translation into English, gratuitously, of his Urdu Hand-book of Gardening, (though such would seem to be the inference by a previous correspondence,) but is willing to undertake it for the sum of three hundred rupees

Resolved,—That Mr. Fenwick's proposal be declined.

*Report of the Agricultural and Horticultural Society of India,
for the year 1848.*

The close of another year in the career of the Society calls for the usual outline of its proceedings since the sub-
Introduction. mission of its report for 1847.

And first, commencing, agreeably to former usage, with the details relating to its internal economy, the Economy of the Society—Elections. Society, while not claiming a total exemption from the consequences resulting from a year of almost unprecedented distress, is glad to remark, that it has suffered as little, or perhaps less, than most other public institutions in the country. The number of elections during the year has aggregated fifty-nine,* or three less than that of 1847. The losses from deaths and resignations have been considerable. There have been twenty deaths, and forty-eight resignations; (fully three-fourths of whom have urged altered circumstances as their reason for seceding,) and five have been struck off for non-payment of subscription, making in all seventy-three.

The following tabular statement, in continuation of those in former reports, affords full details, and represents, at the same time, an analysis of the constitution of the Society:—

	In 1845.	In 1846.	In 1847.	In 1848.	Gross Total.	Total real number at the close of 1848, after deducting lapses.
Honorary Members,	11	0	0	1	13	10
Free Members,	2	0	0	0	2	2
Corresponding Members,	0	0	1	0	1	1
Civilians in service of Government, ...	223	9	13	15	260	179
Merchants and Traders,	186	15	14	12	227	136
Indigo and other Tropical Agriculturists, ...	188	2	15	6	211	80
Military Officers,	147	13	10	11	181	102
Medical Officers,	78	2	0	2	82	22
Asiatics,	58	6	2	14	80	43
Clergy,	13	1	1	0	15	4
Law Officers,	38	2	1	0	41	17
Miscellaneous,	9	0	0	2	11	8
	50	58	62	60	1182	604

* The tabular statement represents the number as sixty; but this is caused by the transfer of the name of James Hume, Esq., to the list of Honorary members.

Of this number (604) thirty-six are members who have compounded for their subscriptions; one hundred and forty are absent from India;* ten are honorary, one a corresponding, and two are free members (in all 189); leaving four hundred and fifteen as the actual number of paying members on the books of the Society, or twenty-nine less than last year.

Among the calamities which have befallen the Society by the Economy of the Society—*Necrology.* hand of death, the loss of its late President, Sir John Peter Grant, on his passage to his native land, may be classed as the most prominent. Joining the Society shortly after his arrival on this side of India, he continued to take a warm interest in its welfare, first as a Vice-President, and afterwards for six years as President, or till the period of his departure in March last. The published address, readily and unanimously voted to him by the Society, so fully conveys the estimation in which he was held for his “steady attention to the affairs of the institution, and for his invariable courtesy and impartiality, promoting a cordial co-operation, so essential to success,” that it becomes unnecessary to add more in this report than the repetition of our deep regret at the loss of an old and valued associate;—one whose name is too intimately connected with the prosperity of the Society, not to be borne gratefully in remembrance by every member who had an opportunity of estimating the nature of the services which he has rendered to it.

It should, however, be mentioned, that in addition to the address noticed above, the Society invited their late President to sit for his picture in England, to be placed in its large meeting room; but it is to be feared, his lamented death will prevent the Society obtaining this memorial, as it does not appear there is any good picture from which to make a copy.

The other members whose demise the Society is called on to record, are—the Baron Von Ludwig, an Honorary Member; Col. James Sutherland, Supt. of Ajmere; the Honorable F. Drummond, of the Civil Service; Sir Henry Seton; Baboo Roy Pctumber Mitter; Mr. J. E. Becher, Indigo planter; Brigadier Stacy, C. B.; Mr. A. F. Donnelly,

* The departures from India have been unusually numerous during 1848, aggregating 29; while the returns during the same period, having been only 8, leave a deficit of 21 on the paying list.

Civil Service ; Dr. George Turner, Medical Service ; Mr. Wm. Patrick, Merchant ; Mr. A. C. Dunlop, Indigo planter ; Mr. W. Ridsdale, Supt. Military Orphan Press ; Mr. J. B. Ogilvy, Civil Service ; Mr. Geo. Massey, Merchant ; Mr. John Hamilton, Merchant ; Mr. J. W. Yule, Indigo planter ; Mr. James Crooke, Merchant ; Mr. R. Neave, C. S., and Capt. Dallas, Offg. Secy. Military Board.

Turning from this mournful subject, it is gratifying to intimate that the Society has gained the countenance Patron of the Society. and support of the distinguished nobleman at the head of the Government. The Earl of Dalhousie has not only consented to become Patron, but been pleased to consider himself a member of the institution, and, as such, has intimated his intention of contributing to its funds an annual sum of Rs. 500 during his residence in India.

It is also very satisfactory to the Society to announce the election of Sir Lawrence Peel to the office of President, in the room of Sir J. P. Grant.

In several past reports the Society has had occasion to notice the

Award of a gold assistance it has derived from the efforts of one medal to Col. Ouseley. of its most active and zealous members, Lieut. Col. Ouseley, the agent to the Governor General, S. W. Frontier. It has now the satisfaction to add that, during the past year, it has awarded its gold medal to that officer, as an acknowledgment of its sense of these services generally, and especially for "his continued exertions in bringing to notice, and in improving the vegetable products of the district under his charge, as well as the valuable grains and seeds of Central India."

The Society has also been pleased to enroll the name of James Hume, Esq., on its list of Honorary Members, Award of an Honorary Membership to "as a small return for his distinguished and James Hume, Esq. zealous services as Honorary Secretary."

The Society has been in steady communication during the year with several of its Branches, more especially with those at Bhaugleapore and Lucknow. The interesting outline* of the rise and progress of the first named Association from the pen of its

Branch Societies and Gardens—Bhaugleapore, Lucknow, Beerbhoom, &c. &c.

* This report is published in the Journal, Vol. vi. part ii.

indefatigable Secretary, Major Napleton, shows at a glance how much real good it has already been the means of effecting; while the published accounts of its periodical exhibitions most strikingly prove that the cause of Horticulture and Floriculture is steadily progressing in Bhanglepore, and the adjacent districts.

The Society and Garden at Lucknow, are also well attended to under the able management of Captain Hollings. This garden, it should be observed, is maintained entirely by the sale of its products, and the main object for which it was formed, namely, the growth of new kinds of grains and other useful cultures, with a view to their dissemination throughout Oude, has been always kept in view and acted on.

In addition to the gardens enumerated in the last report, Berhampore, Benares, Cawnpore, Cuttack, &c., the Society is glad to announce the formation of another small one at Beerbhoom, under the fostering care of the Magistrate of the district, E. E. Woodcock, Esq. This garden has been established by Mr. Woodcock, for the cultivation of foreign products, with a view to the distribution of the acclimated seed among the ryots in the vicinity of Sooree. In order to aid this laudable endeavour the Society has furnished, during the year, supplies of American maize and cotton seed, Carolina paddy, white linseed, wheat, vegetable seeds, &c.

In regard to the Nursery-garden it may be observed, that the large ditch, to which allusion was made in the last report, was completed in the early part of the year. It extends the whole length and breadth of the garden, or 2,750 feet; and, being 7 feet deep and 14 feet broad, will prove, it is fully expected, a sufficiently good protection to the garden generally, more especially to the orchard, which now, indeed, forms the most valuable portion of the ground. The distribution of fruit-tree grafts has been continued during the year, and will, no doubt, annually increase when the circumstance of grafts of the best description being available from this locality is more generally known.

For sugar-cane there has been such a very limited demand this season that it has been determined to reduce the culture considerably, confining it to one beegah, and that merely with the view of retaining specimens of the various sorts.

The demand throughout the year for flowering plants and shrubs has been tolerably constant; and these, as also products of an useful nature, have been distributed to the utmost extent of the Society's means.

The little school for gardeners, which was established last year, is

Nursery-Garden— progressing satisfactorily. The native teacher
School for Gardeners. has been attentive to his duties, and the boys very regular in their attendance. A certain time is allotted them for learning to read and write, and the remaining hours are given for out-door operations. Several of the lads being smart and active, are likely to become good gardeners in the course of a short time, when their services will be available to members in want of such servants.

Before quitting this subject the Society would tender its acknow-

Nursery-Garden— ledgments to all those who have contributed to
Acknowledgment of its stock of plants and fruit trees since the
donations. submission of its last report. To enumerate

the names of all the donors would be occupying an unnecessary space, but a few may, with propriety, be introduced. To the Bhau-
glepore branch institution it is indebted for some very fine Bombay mango grafts; to Col. Ouseley for raspberry plants; to C. F. Juritz, Esq., H. D. M. Consul at the Cape of Good Hope, for an assortment of vine and fig cuttings; to Mr. L. Manley for a collection of *Pelargoniums*; to Mr. Geo. Wood for some nutmeg plants, a plant of *Bignonia chirere*, and a new sort of *Ixora*; to Mr. W. Stalkart for a further supply of cuttings of his superior purple and white grapes; and to Mr. Robert Wood, for a fine plant of *Cordia Sebestena*.

The Society has reason to be again satisfied with its importations

Horticultural De- of vegetable and flower seeds from the United
partment—Imported States and England. It has, however, been
vegetable and flower unfortunate in the loss, by the wreck of the
seeds. *Greenlaw*, of a large consignment from the Cape of Good Hope, which considerably crippled its resources. To remedy this in some measure, and no other stock of imported seed, that could be depended on, being available in the market, a purchase was made of a quantity of acclimated vegetable seed, the produce of the Bhau-
glepore Society's garden. It is also indebted to that Branch, to the garden at Lucknow, and to Professor Royle, for gratuitous assortments of garden and flower seeds.

Three exhibitions of fruits and vegetables have been held during the year—in February, May, and October,—
 Horti-floricultural Department—Vegetable, fruit and flower shows. when three silver medals and Rs. 416 were distributed to the successful candidates. During the same period four shows of flowers have taken place, namely, on 1st March, 15th of April, 28th of October, and 30th December; and Rs. 492 have been awarded in the aggregate, from the funds placed for this purpose at the Society's disposal by the liberality of its President, Sir L. Peel. The exhibition of March was an exceedingly good one, decidedly the best in every respect that has yet taken place; that of December was also an advance on '47 and '46; but the remaining two can scarcely be considered as any improvement on those of the previous year, except that, perhaps, the competition was rather more spirited. It has been resolved, for the future, to introduce more stringent rules at these shows, as regards the arrangement of the plants, with the view of enabling the judges to arrive at a speedier and more correct judgment respecting their qualities, growth, &c.

In the Agricultural Department the Society has received and distributed supplies of American cotton and maize seed of sorts, more especially the latter, for which there has been a constant demand. It has also been placed in a position to disseminate other kinds of useful seeds through the liberality of some of its members. From Dr. Jameson, Superintendent H. C. Botanic Garden, N. W. Provinces, it has received several despatches of seeds of Himalayan *Coniferae*, and China tea seed, acclimated in the nurseries at Kulnaon. Col. Ouseley has again forwarded a supply of white linseed and *Julalya* wheat. Col. Ouseley mentions, he has transmitted a quantity of this wheat and the *Pissee* variety to Sir H. Willock, with the view of obtaining the opinion of English farmers on this produce of the Nerbudda valley.* To Mr. Jeffrey Finch

* Since this was written, the Society has received a very satisfactory report on these samples, through the kindness of Professor Royle, who states, that they are considered the finest specimens in the London market, and that the soft description (*Pissee*) is valued at from 4 to 5 and 6 shillings above the highest prices of the day.

the Society is indebted for a large supply (5 maunds) of the same description of linseed, acclimated in his lands at Shapore Oondee, Tirhoot: to Capt. Latter for a quantity of teak seed, the produce of the Tenasserim forests: to Dr. Wight for a further supply of the seed of *Nerium tinctorium*, or indigo-yielding *Oleander*: to the Natural History Society at Mauritius for seed of the screw pine (*Pandanus vacoa*): to Major Jenkins for a supply of Assam tea seed; and to Professor Royle for several small despatches of cereal grains by the overland conveyance.

The Society has likewise received through the kindness of Dr. Agricultural Department—*Carob* seed. Abbott of Cairo, a quantity of the seed of the *Carob* tree (*Ceratonia siliqua*).* This seed was applied for (at the suggestion of Dr. Falconer) with a view to its introduction in the more arid parts of the Punjab; its distribution has not, however, been limited to that quarter, but it has been dissemi-

* "The *Carob* tree, a native of Syria, and the hottest parts of the south of Europe. This forms a large tree, which bears in abundance pods filled with a nutritious substance. It is tenacious of life in a singular degree, and seeks its nourishment far from the surface of the ground, on which account it suffers little from the long continuance of drought. The pods are a common article of food in the countries where the tree is found, and are by some supposed to be the "locusts" on which St. John fed in the wilderness; they are sometimes sold in the fruiterers' shops of London. During the Peninsular war, the pods were found of great value as food for cavalry horses, and I entertain no doubt that if the tree could be extensively introduced into the milder parts of Northern India, it would render the famines we read of almost impossible."—*Extract of a communication from Dr. Lindley to the Court of Directors, published in the Proceedings of the Agricultural Society of India for June 1839. Transactions, Vol. vii. p. 81 Appendix.*

"That it (*Carob*) is very retentive of life we may conclude from a fact mentioned by M. Bové, of a tree supposed to be nearly 300 years old, which was cut down by the French in their invasion of Egypt, 30 years afterwards. Ibrahim Pacha having cleared the ground and sunk wells in the neighbourhood, the return of moisture induced the springing out of some branches, which in 3 years were from 10 to 12 feet in height; the abundance of the produce of the *Carob*, some trees yielding as much as 800 or 900 pounds of fruits or pods, renders these so cheap that they are eaten by the poorest people, and even given to cattle, mules, asses and horses in Egypt, Syria and the south of Europe."—*Royle's Illustrations of Himalayan Botany.*

nated over various parts of India, where the growth of so valuable a tree, more especially in the N. W. Provinces, cannot fail to prove beneficial to the poorer classes.

It may here be added, by way of record, that the large supply of Agricultural Department—Carolina paddy. Carolina paddy, which was ordered by the Government of Bengal through the intervention of the Society, for trial on the Arracan coast, and to which circumstance a reference is made in the last Report, was received in June, and duly forwarded to its destination. A small proportion (12 mds.) which was placed at the disposal of the Society, has been widely distributed; and from the fact of its having arrived in excellent condition, (as is proved by the speedy germination of a small quantity, sown in the garden immediately after its receipt) the Society hopes to obtain favorable reports, in the course of the ensuing year, from the authorities at Arracan and other parties.

During the past year the Society has been in correspondence with Agricultural Department—Dr. Wight, Superintendent of the Government Mexican cotton. Cotton Farms at Coimbatore, regarding the cultivation of the Mexican cotton plant in India. Dr. Wight is of opinion, that hitherto an error has been committed in viewing this plant as an extra-tropical one, cultivating it in the cold season; and that "treated as a tropical plant, every part of India is adapted to its successful cultivation." The grounds on which this opinion is based, with other interesting particulars, having been published *in extenso* in the Journal, need not be recapitulated here. It may suffice to mention that, with the view of aiding Dr. Wight in the prosecution of his very useful enquiry, the Society has obtained from that officer a supply of seed of this variety, the produce of the farms under his charge, and distributed the same in various localities on this side of India. The reports which may be expected in the early part of next year from those who have undertaken the culture, will form the subject of future remark.

Allusion was made in the last summary to the receipt, from Mr.

Agricultural Department—C. B. Taylor of Palamow, of a quantity of the Mowah oil. oil of the *Mowah* nut (*Bassia latifolia*), and to its transmission to the E. I. and China Association, and the Society of Arts, in order to have it fairly tested as a fit ingredient

for candle and soap-manufacture, or for any other useful purpose. The Society is happy to announce, that it has received very satisfactory reports on the subject from both those bodies, which will be shortly published for general information. The result of the opinions afforded by several eminent chemists and brokers is to the effect, that this oil "is likely to be of great importance for most commercial purposes, if it can be obtained in bulk at a price not exceeding that of palm oil." As the tree is to be commonly met with in most parts of India, and the expence of collecting the nuts is trifling, it is to be hoped, the favorable opinion entertained by practical men of this oil may induce speculation, and so lead to its general introduction into the English market.

Among several presents during the year to the museum, a few may be enumerated as more particularly deserving Museum—Acknow- of record. To Dr. Hufnagle, a Vice-President and Honorary Member, the Society is indebted for a rare collection of American veneered woods: to Major Jenkins, for further specimens of fibrous materials: to Mr. Sconce, C. S., for a quantity of pods of the *Tere* of Chittagong, an undescribed species of *Caesalpinia*, affording an excellent tannin: to Mr. Teil, for specimens of cow-hide and calf-skin, tanned with the above material, and a bottle of dye-stuff from the same pods: to the Society of Arts, for samples of soap made from the *Mowah* oil: and to Col. Ouseley, for an excellent specimen of rose-water procured by distillation from the rose-apple, the produce of *Eugenia jambos*.

The Society would again prefer its application to the members at large, and correspondents generally, for contributions, with the view of enhancing the value of this department of vegetable and mineral products. Specimens from all parts of India of grains of sorts, tanning and dyeing substances, wild silks, gums, gum-resins, oils and fibrous materials, will always be acceptable.

In this branch of its labors, the Society has but little to record, having published only two parts of its Journal Literary Department. during the year; viz. Parts II. and III. of Volume 6. These numbers, however, contain several papers of interest, among which may be enumerated Dr. Jameson's Report on the tea plantations in Kemaon and Gurhwal: Dr. Wight's remarks on the

culture of American cotton in India : Messrs. Hodgson's and Frith's notes on certain species of silk-worms indigenous to India : Dr. Falconer's remarks on timber, trees and materials for fuel : Correspondence from various parties respecting the cultivation of wheat in India : Dr. Campbell's notes on the *Pooah* fibre of Sekim, and on the culture of the tea plant at Darjeeling : and a memorandum regarding fibrous materials from Assam and Chittagong.

The Society is so dependent on its correspondents for useful and interesting information for its Journal, that it trusts they will not hesitate to communicate readily such facts relative to the agriculture and rural economy of their respective districts as may come within their notice. And it must be borne in mind, that it is only by such steady co-operation that the Society can hope to make its Journal an useful medium of communication on the various subjects it professes to treat.

The importance of endeavouring to obtain a machine better adapted

<p>Subjects that have engaged attention— A cotton-cleaning machine of an improved description.</p>	<p>for an expeditious and economical separation of our indigenous cotton from its seed and the little native <i>churka</i>, has commanded the attention of the Society for several years past.</p>
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Some details on this subject were afforded in the last report. It now remains to add, that during the present year three machines were entered for competition for the Society's gold medal, and Major Jenkins' handsome premium of Rs. 500 ; namely, Mr. Robert Burn's patent machines from Edinburgh, Mr. Potter's of Manchester, designed by the late Mr. Owen Potter of this city, and Mr. J. H. Mather's, which has been manufactured in Calcutta. These machines were referred, for examination and report, to a Special Committee, consisting of the Members of the "Cotton Committee," and "Committee for implements of husbandry and machinery," with the addition of F. W. Simms, Esq., Consulting Engineer to the Govt. of India, who had obligingly agreed to afford his valuable aid. The Committee, after a careful series of experiments, furnished their report at the November meeting, and at the following meeting in December, a communication having been previously made with Major Jenkins, it was resolved,—that the gold medal and prize of Rs. 500, be awarded to Mr. Mather, for the successful results of

his improved *churka*, as respects the superior cleaning of the cotton, and the quantity turned out in a given time.

To another important matter, namely, the improvement of agri-

Subjects that have engaged attention—
Establishment of annual shows of cattle and country produce at the Titalya fair.

culture and rural husbandry in the districts of Rungpore, Pooneah, Dinagepore, Bogra, Rajshaye, Bhauglepore, Moorshedabad and Malda, the attention of the Society has been called by a zealous member, Dr. Campbell, Superintendent of Darjeeling. In order to attain this very desirable object it is purposed to institute a system of annual prizes to be distributed at the Titalya fair. The subject was duly discussed at the March meeting, when Dr. Campbell's communication, the programme of prizes, and other details were submitted. It is unnecessary to introduce these particulars into this summary, as they will be found duly recorded in the proceedings for that month: but it may be mentioned that the Society, cordially approving of the scheme, most readily agreed, as a beginning, to give an annual donation of Rs. 100 or silver medals of that value; to be increased hereafter, should it be deemed necessary. The first distribution of prizes will take place in January 1849, in which month the fair is to be held.

A third subject to which some consideration has been given has

Subjects that have engaged attention—
Measures for improving the Agricultural and Horticultural produce of the Punjab.

reference to the improvement of the agricultural and horticultural produce of the Punjab. The matter was first brought to notice in the form of a communication from Major Napier, of the Engineers, Durbar Chief Engineer at Lahore, announcing the plan which had been decided on in that city, with the view of effecting this desirable object, and seeking the Society's co-operation towards disseminating improved kinds of grains, fruits and vegetables throughout the Punjab, principally by means of the large State Gardens at Shalimar and Amritsir. Aided by Dr. Falconer, Superintendent of the H. C. Botanic Garden, Calcutta, who has furnished several valuable hints, and promised to contribute any available materials from the noble institution under his charge, the Society has been despatching, at certain intervals, supplies of cereal grains of sorts, especially several descriptions of maize, the produce of the United States, Carolina paddy, wheats of

Central India and England. American cotton seed, with a large assortment of foreign vegetable and flower seeds, and the *Carob* seed, to which allusion has already been made, have been also forwarded as a commencement. The Society hopes to continue these despatches as opportunities offer, and indeed, to furnish every aid consistent with its means, towards so laudable an undertaking.

It was stated in the last summary, with reference to certain particulars which had been brought to its notice,

Subjects that have engaged attention—
The *Kunchoora* fibre of Rungpore or *Rheea* of Assam—its probable identity with the “China grass.”

that the Society was instituting enquiries with the view of ascertaining whether the species of nettle (*Urtica tenacissima*), known in Bengal and Assam as the “*Kunchoora*” and “*Rheea*,”

is the same as that producing the grass-cloth of China. The Society has received a very interesting paper on the subject from Dr. Macgowan at Ningpo, which is now in the press, and will appear in the next number of the Journal. Unfortunately, the writer has omitted to send specimens of the flowers of the several plants alluded to by him as yielding this fibre; but his description of the principal plant is stated by Dr. Falconer to be “entirely that of the species of *Bahmeria* (formerly *Urtica*), called *B. nivea* or *tenacissima* by Botanists, or of a nearly allied species.” The receipt of the specimens, for which an application has been made to Dr. Macgowan, will set this question at rest. It is a rather important one, for, as observed in the last report, “should this plant be found identical with the nettle of Bengal and Assam, the attention of those who are now engaged in the introduction into England of the material from which the grass-cloth is made, might be advantageously turned to the Indian product, in order to ascertain if it can be grown and prepared at a less cost.”

Such is a brief notice of some of the objects which have passed in review before the Society during the last

Conclusion.

twelve months. Several others have engaged attention, but to detail them all would be tedious:

—nor is it necessary, as they are fully noted in the monthly proceedings. The Society cannot, however, close its report without expressing its hope, that as it has hitherto kept steadily in view the various objects for the improvement of which it was established;

and thus endeavoured, to the best of its ability, earnestly and honestly to fulfil its mission, it will continue to receive from the residents of India that encouragement and support so necessary to enable it to progress, in a satisfactory manner, in its career of public utility.

Report of the Finance Committee.

1. The Finance Committee, in offering their annual report, beg to submit the following statements of the income and expenditure of the Society for the year 1848.

2. The total receipts have been Co's. Rs. 19,229-12-9, including the Government donation of Rs. 2,675; the Earl of Dalhousie's annual subscription of Rs. 500; Sir L. Peel's annual donation of Rs. 400; accruings of interest on fixed assets, of Rs. 823-10-6, and Rs. 451 realized by sale of sugar-cane, copies of the Journal, &c.

3. The total disbursements for the same period amount to Co's. Rs. 17,374-0-5, which include Co's. Rs. 704 for repairs to the Metcalfe Hall, and Co's. Rs. 612, extraordinary expences on account of the nursery garden. There has likewise been invested in Government securities, during the past year, the further sum of Co's. Rs. 3,605-15-7.

4. The Vested Fund, with the addition above noted, now amounts to Rs. 19,200, as shown in the Government Agent's account current annexed to this report, and the memorandum subjoined.

5. Though the rule recommended in their last Report, viz. the "withholding all supplies of seeds, plants and copies of the Journal from members whose subscriptions are four or five quarters in arrear," has proved beneficial in several instances, the Committee regret to observe that the list is yet a very heavy one; showing an aggregate of Rs. 8,936, after deducting the sum of Rs. 3,003, which has been written off as irrecoverable, namely, Rs. 2,415, the arrears of former years, and Rs. 588, the arrears of 1848. Of the arrears at the close of 1847, consisting of Rs. 11,105, the sum of Rs. 5,247 has been collected during 1848, leaving a balance on that account of Rs. 3,443, after deducting the sum above-mentioned of Rs. 2,415. As the larger proportion of the arrears detailed in the list now submitted, namely, Rs. 5,493, has accumulated during 1848, the Committee hope to

present a more favorable result in their next report, under this head, than is now exhibited.

6. Lastly,—the Committee are happy to add, that while the Vested Fund has been considerably increased during the year, there is only one liability against the Society, viz. the sum of Sp. Drs. 957-19, for the last consignment of seeds received from Mr. Landreth, of Philadelphia; and this, the cash balance of Rs. 1,578, will materially aid in meeting.

CHARLES HUFFNAGLE.

ALFRED TURNER.

M. S. STAUNTON.

CALCUTTA:

31st December, 1848.

MEMO.

At the close of 1842, the Society's Vested Fund amounted	
to Rupees	10,433
At the close of 1848, it amounts to	19,200
or, an addition of Rupees ..	8,767
During which time, it has paid a loan contracted	
in 1841, of	1,500
And in 1845-46 paid an extraordinary charge for	
furniture for Metcalfe Hall, of	1,500
	<hr/>
	3,000
Total Rs.	11,767

The Society has also repaid a loan of Rs. 5,000 taken in 1845, on account of the Metcalfe Hall; but this is not introduced in the above account, because the additional 8 Rs. per annum for 7 quarters, levied from each member, sufficed to repay this sum.

Statement of Receipts and Disbursements of the Agricultural and Horticultural Society of India, from 1st January to the 31st December, 1848.

RECEIPTS.

From Members, subscriptions collected during the year for the ordinary purposes of the Society,	13,041	3	6	
„ Ditto, additional temporary subscriptions to assist in meeting the Society's proportion of the debt on the Metcalfe Hall, ...	454	0	0	
				13,495 3 6
„ The Right Hon'ble the Earl of Dalhousie, annual donation,	500	0	0	
„ Government ditto,	1,045	0	0	
„ Ditto, monthly allowance for 12 months, at 135-13-6 per month, ...	1,630	2	0	
				3,175 2 0
„ Sir Lawrence Peel, donation to the Society for the year, to encourage the culture of flowers, &c.,				400 0 0
„ Accruings of interest on fixed assets,				823 10 6
„ Proceeds of sugar-cane delivered from the nursery garden in 1847,	131	4	0	
„ Ditto of mango grafts, ditto from ditto,	43	6	0	
„ Ditto of a portion of surplus Cape and American vegetable seeds sold in 1847,	56	0	0	
„ Ditto of copies of the Transactions of the Society,	48	0	0	
„ Ditto of copies of the Journal of the Society,	27	3	3	
„ Ditto of copies of Fenwick's Hand-book of Gardening, ...	124	0	0	
„ Ditto of old seed boxes of sorts,	8	8	0	
„ Government of the North-Western Provinces, part cost of lithographing drawings illustrative of Dr. Jameson's Report on the tea plantations of Kemaon and Gurhwall, ...	725	0	0	
„ Deputy Commissioner of Arracan, for the cost of collecting a supply of doob grass seed,	7	0	0	
„ Members, being the amount of freight on boxes of seeds paid by the Society in 1846 and 1847,	6	6	9	
„ Major R. Napier, to meet certain charges for seeds required for the State Gardens of the Punjab,	100	0	0	
				1,276 12 0
„ Assignee, Estate Alexander and Co., being the amount of third dividend at the rate of 2 As. 9 P. per 100 Sa. Rs. on the Society's claim of Sa. Rs. 24,783,	42	9	6	
„ Saunders, May, Fordyce and Co., first and second dividends on their bill for £ 10 on Reed, Irving and Co., in favor of Smith, Elder and Co.,	16	7	3	
				59 0 9
Total Receipts, Co's. Rs.	19,229	12	9	
„ Balance in the Bank of Bengal on 31st December, 1847, ...	3,184	4	11	
„ Ditto, in the hands of Government Agent on ditto, ...	144	12	3	
				3,329 1 2
Grand Total, Co's. Rs.	22,558	13	11	

DISBURSEMENTS.

FOREIGN VEGETABLE AND FLOWER SEEDS.

By Mr. Carter, for English flower seeds supplied in 1848, ...	1,416	0	6	
„ „ D. Landreth, for American garden and flower seeds supplied in 1847, ...	2,224	9	0	
„ The Berhampore Branch Society for a box of English flower seeds from Carter and Co., ...	45	0	0	
„ Harley and Co., for 205 packets of acclimated Bhaugleporé vegetable seeds, ...	333	2	0	
				4,018 11 6

LIBRARY.

„ Books purchased during the year for the library, ...	347	14	1	
„ Binding books during the year, ...	11	4	0	
				359 2 1

PRINTING.

„ Sundry parties, for printing receipts, &c., ...				103 13 9
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JOURNAL.

„ Bishop's College Press, for printing parts 2 and 3 of Volume 6, ...	881	10	0	
„ Lithographing and coloring plates and drawings for Journal, ...	904	8	0	
„ Paper for plates for ditto, ...	4	2	0	
				1,790 4 0

NURSERY GARDEN.

„ Ordinary expences incurred on account of the nursery garden, from 1st December 1847 to 30th November 1848, inclusive of cost (Rs. 175) of digging boundary ditch, ...	2,642	9	0	
„ Additional expence for laying down pukka walks, building a pukka house for cattle, &c., ...	277	4	0	
„ Mr. H. A. Porteous, for a survey and plan of the Society's garden, ...	160	0	0	
				3,079 13 0

ESTABLISHMENT.

„ Amount for establishment from 1st December 1847 to 30th November 1848, ...	4,491	8	0	
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MEDALS.

„ Hamilton & Co., for silver medals, ...	176	4	0	
--	-----	---	---	--

PECUNIARY REWARDS.

„ Prizes to mallees for vegetables and fruits, at the exhibitions held on the 4th February, 29th May, and 6th December, ...	416	0	0	
„ Ditto to ditto for flowers, at the exhibitions held on the 1st March, 15th April, 28th October, and 30th December, ...	492	0	0	
„ The Bhaugleporé Branch Society, annual donations for 1847 and 1848, ...	100	0	0	
„ The Hooghly Branch ditto ditto, for 1848, ...	50	0	0	
				1,058 0 0

FENWICK'S HAND-BOOK OF GARDENING.

„ C. Martin, for binding a presentation copy of Fenwick's hand-book, ...	7	0	0	
„ Holmes and Co., Cossid hire for the conveyance of 40 copies of ditto to Dinagapore, for sale at the Titalya fair, ...	13	8	6	
				20 8 6
„ H. Fenwick, proceeds of 50 copies of his hand-book, ...				100 0 0

SOCIETY'S VESTED FUND.

By the Government Agent, for the purchase of 2nd 5 per cent. Government Promissory Note for Sa. Rs. 3,000 (inclusive of interest) to be added to the Vested Fund,				3,082	8	6
,, Ditto, for a 3rd 5 per cent. Note for Sa. Rs. 500, inclusive of interest,				523	7	1
				<hr/>		
CAPE BULBS.					3,605	15 7
,, Bagshaw and Co., for a quantity of Cape bulbs,					35	0 0
METCALFE HALL.						
,, J. Grey, J. M. Vos, and Jas. Mackintosh, for a survey and report on defective columns of Metcalfe Hall,				192	0	0
,, Burn and Co., one-half in advance of their estimate for renewing two defective columns to eastern porch of Metcalfe Hall,				511	15	6
,, Doorjoodhone Doss, for a mat for the large hall,				54	0	0
,, Sherriff and Co., for pitching ditto,				50	0	0
,, Sundry parties, for various articles of furniture for the hall,				149	8	9
				<hr/>		
ADVERTISEMENTS.					937	8 3
,, Advertising in the public prints, notices of general meetings, of shows of flowers and vegetables, distribution of seeds, sugar-cane, &c. &c. &c.,					412	4 0
STATIONERY.						
,, Stationery for office books, and for the use of the office.				91	8	0
,, Ditto $\frac{1}{2}$ ream of brown packing paper for packing seeds,				5	0	0
				<hr/>		
FREIGHT.					96	8 0
,, Freight on boxes of seeds, books, &c., sent and received from Cape, England, America, &c.					115	2 11
POSTAGE AND SUNDRY OTHER CHARGES.						
,, Postage on the Journal, on letters sent and received, and for petty expenses,				450	0	0
,, Extra packermen and writer, for sub-dividing and writing on seeds,					7	10 0
,, Tinsmith, for soldering tin boxes for seeds,					8	9 6
,, Presents to Constables for attending at horticultural and floricultural exhibitions during the year,				72	0	0
,, A supply of fruit trees for the Society's nursery garden,				34	13	0
,, A supply of doob grass seed for transmission to the Commissioner of Arracan,				6	8	0
				<hr/>		
					579	8 6
Total Disbursements, Co's. Rs.					20,980	0 1
,, Balance in the Bank of Bengal on 31st December 1848,				1,133	14	2
,, Ditto in the hands of Government Agent on ditto,				444	15	8
				<hr/>		
					1,578	13 10
Grand Total, Co's. Rs.					22,558	13 11

MEMORANDUM.

DISBURSEMENTS.		RECEIPTS.	
To amount of Disbursements during the year 1848, as per Statement,		By amount of Receipts during the year 1848, as per Statement,	
Balance in the Bank of Bengal on 31st December 1848,	20,950 0 1	Balance in the Bank of Bengal on 31st December 1847,	19,229 12 9
Ditto in the hands of Government Agent on ditto,	1,133 14 2	3,184 4 11	
	444 15 8	144 12 3	
	1,578 13 10	3,329 1 2	
Total, Co's. Rs.	22,558 13 11	Total, Co's. Rs.	22,558 13 11
LIABILITIES.		DEPENDENCIES.	
Amount due by the Society for American vegetable and flower seeds supplied in 1848,		Amount invested in Government securities lodged in the Government Agency Office,	
	957 19 6	Rs. 19,200 0 0	
		Amount of subscription in arrears,	8,936 11 0

LIST OF MEMBERS
OF THE
Agricultural & Horticultural Society

INDIA.

DECEMBER 31st, 1848.

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THE RIGHT HONORABLE THE EARL OF DALHOUSIE,
GOVERNOR GENERAL OF INDIA, ETC. ETC.

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‡ This mark denotes Members, who though absent, are desirous of continuing their Subscriptions.

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Kirke, Captain H. (12th N. I.) Supt. of the Dhoon Canal, Deyrah.

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Calcutta.

Laidlay, J. W. Esq. Merchant, Calcutta.

Lake,† W. H. Esq. Merchant.

Lake, R. B. Esq. Merchant, Calcutta.

Lall Beharee Dutt, Baboo, Merchant, Calcutta.

Lamb, George, Esq. Medical service, Calcutta.

Lamb, Capt. Wm. (51st N. I.) Lucknow.

Lang,† A. Esq. Civil service.

Larmour, R. T. Esq. Indigo planter, Pubna.

Larvletta,* A. Esq. Indigo planter, Jeygunge.

Latte, Captain Thomas, (67th Regiment N. I.)

Lattey,† R. J. Esq. Merchant.

Lautour, E. F. Esq. Civil service, Furreedpore.

Lawrence, Lieut.-Colonel Sir H. M., C.B. Army of the Punjaub.

Lawson, W. J. Esq. Indigo planter, Chunar.

Leach,*† Thomas, Esq. Merchant.

Leishman, R. Esq. Merchant, Calcutta.

Leith,† J. F. Esq. Barrister.

Lewis, W. T. Esq. Assistant Resident, Penang.

Liebig,† Dr. Justus, Germany, (Honorary Member.)

Lindsay,† Alexander Kyd, Esq. Medical service.

Llewelyn, J. G. Esq. Calcutta.

Lloyd, Colonel G. W. A., C.B. (28th Regiment N. I.) Lucknow.

Loch,† T. C. Esq. Civil service.

Logan,† W. R. Esq. Indigo planter.

Loughnan, Robert James, Esq. Civil service, Patna.

Lovell, George, Esq. Merchant, Penang.

Lewis, The Honorable John, Civil service, Calcutta.

Lowth, Frederick,* Esq. Civil service, Balasore.

Lowther,* Robert, Esq. Civil service, Allahabad.

Luke, William, Esq. Civil service, East Burdwan.

Lushington, Frederick A. Esq. Civil service.

Lushington, Edward, Esq. Civil service, Patna.

Lyall,† Charles, Esq. Merchant.

Lyall,† Robert, Esq. Merchant.

McArthur, Peter, Esq. Indigo planter, Malda.

McCullum, D. Esq. Merchant, Calcutta.

McDonell, E. Esq. Sub-Deputy Opium Agent, Champaran, Tirhoot.

McDowall, William, Esq. Indigo planter, Rungpore.

MacFarlan,† David, Esq. Civil service.

Macfarquhar, Major H. Tavoy.

Mackenzie, James J. Esq. Merchant, Calcutta.

Mackintosh, George G. Esq. Civil service, Burdwan.

Mackay,† J. Esq. (Honorary Member.)

Mackey, D. C. Esq. Merchant, Calcutta.

- MacLagan,* Frederick, Esq. Indigo planter, Kishnagur.
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 McLeod,† Donald Friel, Esq. Civil service, Benares.
 McLeod, Donald, Esq. Tirhoot.
 McLeod, C. Esq. Register, Political Dept. Calcutta.
 McClelland, John, Esq. Medical service, Hazareebaugh.
 Macnair,† Robert, Esq. Indigo planter.
 Macpherson,*† George G. Esq.
 Mactier, T. B. Esq. Civil service, Bancoorah.
 Maddock, The Honorable Sir T. H. Deputy Governor of Bengal, Calcutta.
 Maharaj* Dheraj Matabchund, Bahadoor, Rajah of Burdwan.
 Malct, O. W. Esq. Civil service, Tipperah.
 Manickjee,* Rustomjee, Esq. Merchant, Calcutta.
 Mansell, Charles Grenville, Esq. Civil service, Calcutta.
 Marcus,* J. P. Esq. Calcutta.
 Marks, C. H. Esq. Merchant, Calcutta.
 Marquis, J. Esq. Indigo planter, Pubna.
 Marshman, J. C. Esq. Editor of the Friend of India, Serampore.
 Masters,* J. W. Esq. Assistant to Commissioner of Assam, Nowgong.
 Mather, J. H. Esq. Civil Engineer, Calcutta.
 Mathie,* Major James, (European Regiment,) Deputy Commissioner of Assam.
 Mathews, A. H. Esq. Agent Simla Bank, Simla.
 May,† John Stuart, Esq.
 Meik, Captain Alexander, H. M. 94th Regiment.
 Melville,† The Honorable W. H. L.
 Mercer, G. G. Esq. Indigo planter, Eta.
 Metcalfe,† H. C. Esq. Civil service.
 Millman,† G. C. Esq. Merchant, London.
 Mills,*† Andrew John Moffat, Esq. Civil service.
 Molloy, R. Esq. Attorney, Calcutta.
 Monckton, H. Esq. Civil service, Jaunpore.
 Money,* William James Henry, Esq. Civil service, Chittagong.
 Money, Wigram, Esq. Civil service, Mirzapore.
 Money, David Inglis, Esq. Civil service, Berhampore.
 Montgomery, R. Esq. Civil service, Cawnpore.
 Moore,† Major J. A.
 Moore,† Henry, Esq.
 Mornay, H. Esq. Secretary Assam Company, Calcutta.
 Morton, C. E. Esq., Indigo planter, Mada.
 Morton, T. C. Esq. Barrister, Supreme Court, Calcutta.
 Mouat, Frederick J. Esq. M.D., Secretary to the Council of Education, and Professor of Chemistry, &c. Medical College, Calcutta.
 Munro,† Captain William, F.L.S., and F.B.E.S., (H. M. 39th Regiment.)
 Muspratt, J. R. Esq. Civil service, Bauleah

Mutteelall Seal,* Baboo, Merchant, Calcutta
Mylius,† Captain George, (26th Cameronians.)

Napleton, Major T. E. A. (60th Regiment N. I.) Commandant of
Hill Rangers, Bhauglepor.

Newcomen,† C. E. Esq. Merchant.

Nisbet,† Captain E. P. Commander of the Agincourt, (Free Member.)

Nobinchunder Bhose, Baboo, Merchant, Calcutta.

Nursingchunder Bhose, Baboo, Merchant, Calcutta.

Oakes, Lieut. G. N. (46th N. I.) Junior Assistant G. G's A.
S. W. Frontier, Burkaghur.

O'Brien, Captain Wm. (8th Regt. Nizam's Infantry,) Aurungabad.

Ommaney, M. C. Esq. Civil service, Jampur.

O'Riley, Edward, Esq. Agriculturist, Amherst.

Ouseley, Lieut.-Colonel J. R., G. G's A., S. W. Frontier, and
Commissioner of Chota Nagpore.

Ouseley, Captain R. (50th Regiment N. I.) Principal Assistant G.
G's A., S. W. Frontier, Burkaghur, (Army of the Punjab.)

Owen, Lieut. and Adj. (11th Regiment Madras N. I.) Moulmein.

Owen, J. C. Esq. Pilot service, Calcutta.

Palmer, Lieut.-Colonel Thomas, (72nd Regiment N. I.) Delhi.

Palmer, R. S. Esq. Merchant, Calcutta

Palmer, John Carrington, Esq. Merchant, Calcutta.

Palmer,* Thomas, Esq. Merchant, Calcutta.

Palmer, Charles, Esq. Medical service, Jessore.

Parish, Lieut. W. H. Bengal Artillery, Loodianah.

Parker,† Alfred, Esq. Merchant.

Parker,† Henry Meredith, Esq.

Parsons, Lieut.-Colonel James, C.B. (66th Regiment N. I.) Com-
mandant Gwalior Contingent, Gwalior.

Paton,† Francis Balfour, Esq. Merchant, Calcutta.

Payter,* J. W. Esq. Indigo planter, Bogorah.

Pearychund Mittra, Baboo, Librarian, Public Library, Calcutta.

Peel, The Honorable Sir Lawrence, Chief Justice, Supreme Court,
Calcutta, (President.)

Phayre, Captain A. P. Principal Assistant to the Commissioner of
Tenasserim Provinces, Moulmein, (Army of the Punjab.)

Pottit Parbun Sen, Baboo, Merchant, Calcutta.

Prannauth Bhose, Baboo, Head Accountant, Bank of Bengal.

Prawnkissen Law, Baboo, Merchant, Calcutta.

Price, J. O. Esq. Government Cotton planter, Dacca.

Prinsep, Charles Robert, Esq. LL.D., Standing Counsel, Supreme
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Proby, F. Esq. Merchant, Dacca.

Prosonno Coommar Tagore, Baboo, Calcutta.

Protap Chunder Sing, Rajah, Zemindar, Pakpara.

- Radcliffe, E. Esq. Civil service, Arrah.
 Radhakant Deb, Bahadoor, Rajah, Calcutta.
 Radhamadhub Banoorjee, Baboo, Merchant, Calcutta.
 Radhanauth Sikdar, Baboo, Revenue Survey, Deyrah Dhoon.
 Raikes, Henry Thomas, Esq. Civil service, Midnapore.
 Rainey, W. H. S. Esq. Indigo planter, Kholna, Jessore.
 Rajendur Dutt, Baboo, Merchant, Calcutta.
 Rajkissen* Mookerjee, Baboo, Landholder, Hooghly.
 Ramchand Sing, Rajah, Calcutta.
 Ramgopaul Ghose, Baboo, Merchant, Calcutta, (Vice-President.)
 Ramdhone Ghose, Baboo, Calcutta.
 Ramanauth Tagore, Baboo, Calcutta.
 Rampersaud Roy, Baboo, Merchant, Calcutta.
 Rattray, Robert Haldane, Esq. Civil service, Calcutta.
 Rattray, Lieut. Thomas, (64th N. I.) Dorunda.
 Rayson, P. Esq. Indigo planter, Cossipore factory, via Patoolee.
 Reddie, R. M. Esq. Merchant, Calcutta.
 Reddie, Capt. G. B. (29th Regt. N. I.) Depy. Asst. Commy. Genl.,
 (Army of the Punjaub.)
 Rehling, H. Esq. Indigo planter, Rungpore.
 Reid, J. Esq. Civil service, Patna.
 Reynolds, Lieutenant C. S. (49th Regiment N. I.) Junior Assistant
 Commissioner of Assam, Luckimpore.
 Rich, † Colonel R. (6th Regiment N. I.)
 Richards, * † J. Esq. Merchant.
 Richards, C. J. Esq. Merchant, Calcutta.
 Robinson, * Francis Horsley, Esq. Civil service, Agra.
 Robinson, S. H. Esq. Calcutta
 Robinson, G. B. Esq. Merchant, Calcutta
 Robinson, T. M. Esq. Merchant, Calcutta.
 Robison, Major Hugh, Brigade Major and Paymaster, Nizam's
 Army, Ellichpore Division.
 Rogers, Captain T. E., I. N., Superintendent of Marine, Cal-
 cutta
 Rose, William Grant, Esq. Merchant, Calcutta.
 Rose, Henry, C. Esq. Civil service, Gyah.
 Ross, † A. Esq. Civil service.
 Ross, R. F. Esq. Merchant, Calcutta.
 Royle, † John Forbes, Esq. M.D., Professor of Materia Medica,
 King's College, London, (Honorary Member)
 Russell, C. D. Esq. Civil service, Jessore.
 Russell, Francis Whitworth, Esq. Civil service, Hooghly.
 Russell, A. E. Esq. Civil service, Midnapore.
 Russell, J. L. Esq. Merchant, Calcutta.
 Russickissen Mullick, Baboo, Deputy Collector, Burdwan.
 Rutherford, Capt. W. Collector of Canal Dues, Calcutta.
 Ryan, E. B. Esq. Attorney, Calcutta.
 Ryan, † Right Honorable Sir Edward, A. M. (Honorary Member.)

Sage, Lieut.-Colonel Wm. (48th N. I.) Suptdg. Engineer, N. E. Provinces.

Sagra,† Don Ramas De La, (Honorary Member,) Island of Cuba.

Samuells,*† Edward A. Esq. Civil service.

Sarkies, P. J. Esq. Merchant, Calcutta.

Savi, John Robert, Esq. Indigo planter, Sindoorree, Jessore.

Sawers,† A. Esq. Merchant.

Scott,† George, Esq. Merchant.

Scott, Keith Macalister, Esq. Medical service, Gowhatty, Assam.

Scott, Hercules, Esq. Civil service, Jullundur.

Sconce, Archibald, Esq. Civil service, Chittagong.

Seppings,† John M. Esq.

Sewell, Major T. (11th N. I.) Army Clothing Agent, Fort William.

Sharpe, the Reverend James, Chaplain, Saugor.

Shaw,† Thomas Ambrose, Esq. Civil service.

Shaw,† W. A. Esq. Indigo planter.

Shawe, M. Esq. Civil service, Backergunge.

Shib Chunder Deb, Baboo, Deputy Collector, Midnapore.

Showers,† Major St Geo. D. (72nd Regiment N. I.)

Skipwith, F. Esq. Civil service, Chittagong.

Sleman, Lieut.-Colonel William Henry, (1st Regiment N. I.)

Resident at Lucknow.

Small, James, Esq. Calcutta.

Smith, Samuel, Esq. Proprietor of the Hurkaru Newspaper, Calcutta.

Smith, George Henry, Esq. Civil service, Delhi.

Smith,† Francis Curwen, Esq. Civil service.

Smith,† Robert, Esq. Merchant.

Smith,† Adam Freer, Esq. Merchant, Calcutta.

Smith, Sydney George, Esq. Civil service, Banda.

Speede, G. T. Frederick, Esq. Calcutta, (Free Member.)

Spier,† William, Esq. Merchant.

Spiers,† Captain William.

Spooner, R. Esq. Madras Civil service, Ahmednuggur.

Sreekissen Sing, Baboo, Calcutta.

Sreekissen Mullick, Baboo, Calcutta.

Stainforth,† F. Esq. Civil service.

Stalkart, William, Esq. Merchant, Calcutta.

Staples, Lieut. N. A. Artillery, Dum-Dum.

Staunton, M. S. Esq. Assistant Military Auditor General's Office, Calcutta.

Steel, Major James, (2nd European Regiment) Agra.

Stephenson,† R. M. Esq.

Stevenson,*† William, Esq. Junior, M. D.

Stewart,* Captain W. M. (22nd N. I.) Fort Adjutant, Chunar.

Storm, William, Esq. Merchant, Calcutta, (Vice-President.)

Stopford,† James Sydney, Esq. Merchant.

Stopford, Robert, Esq. Merchant, Calcutta.

Stokes, Lieutenant S. W. (Horse Artillery,) Army of the Punjaub.

- Stowell, C. S. Esq. Merchant, Agra.
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 Strong, F. P. Esq. Medical service, Calcutta.
 Stuart, James, Esq. Merchant, Calcutta. • •
 Sturgis,† Henry P Esq. American Consul, Manilla.
 Sturt, R. R Esq. Civil service.
 Sutherland, Patrick, Esq. Assistant Military Board Office: Calcutta.
 Sutherland, Charles J. Esq. Merchant, Moulmein.
 Sutherland, Thos. Esq. Merchant, Calcutta.
 Sutt Churn Ghosaul, Rajah, Calcutta, (Vice-President.)
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 Swatman,† Captain William, (65th Regiment N. I.)
 Swetenham, H. Esq. Civil service, Dacca.
 Swinhoe, T. B. Esq. Attorney, Calcutta.
- Talib Ally Khan, Zemindar, Gyal.
 Tarrucknauth Roy Bahadoor, Baboo, Principal Sudder Aumeen, Maunbhoom.
 Taylor, George, Esq. Barrister at Law, Calcutta.
 Teil, John, Esq. Tanner, Kidderpore.
 Terry, W. Esq. Indigo planter, Midnapore.
 Thomason, The Honorable James, Lieutenant Governor of the N. W. Provinces, Agra.
 Thomson, R. Scott, Esq. Surgeon, Calcutta.
 Thomson, William, Esq. Merchant, Calcutta.
 Thompson, J. V. Esq. M.D., F.L.S., Deputy Inspector General of Hospitals, Sydney, (Corresponding Member.)
 Thompson, Captain Andrew, Calcutta.
 Thornton, John. Esq. Civil service, Agra.
 Thurburn, R. V. Esq. Merchant, Calcutta.
 Tiemroth,† C. Esq.
 Tiery, L. Esq. Berhampore.
 Todd,† James, Esq.
 Tonnochy, Thomas, Esq. Deputy Collector, Bolundshohur.
 Torrens, Henry, Esq. Civil service, Berhampore.
 Torrens, Robert, Esq. Civil service, Calcutta.
 Tranter, Geo. Esq. Medical service, Meheedpore.
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 Trotter,† John, Esq. Civil service.
 Tucker,† Charles, Esq. Civil service.
 Tucker, Henry Carre, Esq. Civil service, Goruckpore.
 Tulloh, C. R. Esq. Civil service, Mirzapore. •
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 Turner, Alfred, Esq. Merchant, Calcutta.
 Tweedie,† John Esq. Indigo planter.
 Twemlow, Major George, Nizam's Army, Aurungabad.
 Tynan, John, Esq. Superintendent of Salt Chokies, Jessore.

Vansittart, H. Esq. Civil service, Lahore.
 Vaux, G. B. Esq. Calcutta.
 Vetch, Capt. H. Asst. to Commissioner of Assam, Debroghur.
 Vincent, W. Esq. Indigo planter, Cawnpore.
 Vizianagram, Meerza Rajah Vizearam Guzputty Rauze Bahadoor,
 Rajah of.
 Vos, J. M. Esq. Architect, Calcutta.
 Voyle, Lieut. G. E. Artillery, Cossipore.

Waghorn,† Thomas, Esq. (Honorary Member.)
 Wallace, A. Esq. Merchant, Calcutta.
 Wallich,† N. Esq. M. D. (Honorary Member.)
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 Warner,† Edward Lee, Esq.
 Watkins, Thos. Esq. Katsooly, via Munglepore.
 Watson,† Major General Sir James, K.C.B.
 Watson,† John, Esq. Indigo planter.
 Watson,* Robert, Esq. Indigo planter, Calcutta.
 Wauchope, S. Esq. Civil service, Arracan.
 Waugh, Captain A. S. Surveyor General of India, Allahabad.
 Wemyss, Capt. W. B. 9th Cavalry, Brigade Major, Meerut.
 Wemyss,† Captain James.
 Wienholt, W. Esq. Merchant, Calcutta.
 Wight,* Robert, Esq. M.D. Madras Medical service, Superintendent
 Government Cotton plantations, Coimbatore.
 Williams, Fleetwood, Esq. Civil service, Bareilly.
 Willis, Joseph, Esq. Merchant, Calcutta.
 Wilson, A. G. Esq. Deputy Magistrate, Gyah.
 Wilson, Thomas, Esq. Deputy Opium Agent, Ghazeepore.
 Wingrove, E. Esq. Merchant, Calcutta.
 Wise, J. P. Esq. Indigo planter, Dacca.
 Wodehouse, The Honorable P. E. Ceylon Civil service, Columbo.
 Woodcock, T. Parry, Esq. Civil service, Allahabad.
 Woodcock, E. E. Esq. Civil service, Beerbhoom.
 Woodcock, Lieutenant S. C. (Horse Artillery,) Meerut.
 Wood, George, Esq. Calcutta.
 Wood, Browne, Esq. Deputy Magistrate, Santipore.
 Wray,† L. Esq.
 Wyatt, Thomas, Esq. Civil service, Rungpore.
 Wyatt,† G. N. Esq. Indigo planter, Champaran.
 Wylie, Macleod, Esq. Barrister, Supreme Court, Calcutta.
 Young, G. L. Esq. Indigo planter, Midnapore
 Young, J. H. Esq. Civil service, Calcutta.
 Young, Lieut. James, Artillery, Futtehpore.
 Young,† A. R. Esq. Civil service.

[illegible]

Days of the Month.	Observed at 9 h. 50 m.					Observations made at Apparent Noon.					Observed at 4 p. m.					Observations made at Sunset.					Rain Gauges.	
	Temperature.					Temperature.					Temperature.					Temperature.					Elevation.	
	Barometer reduced to 32° Fahrenheit.	Of the Mer.	Of the Air.	Of wet Bulb.	Wind. Direction from 9 h. 50 m.	Barometer reduced to 32° Fahrenheit.	Of the Mer.	Of the Air.	Of wet Bulb.	Wind. Direction from 9 h. 50 m.	Barometer reduced to 32° Fahrenheit.	Of the Mer.	Of the Air.	Of wet Bulb.	Wind. Direction from 4 p. m.	Barometer reduced to 32° Fahrenheit.	Of the Mer.	Of the Air.	Of wet Bulb.	Wind. Direction from 4 p. m.	Upper. Feet. 56.	Lower. Feet. 4.
1	30,046	63.0	63.1	54.2	N. sharp.	30,012	66.8	67.0	56.0	N.	29,952	70.3	68.5	58.0	N. W.	29,952	65.9	65.0	56.0	N.	56	
2	30,079	63.0	66.1	59.0	N. E.	30,027	70.0	70.0	61.0	N. E.	29,965	74.0	73.0	60.1	N.	29,965	65.9	65.0	56.0	N.		
3	30,088	63.5	67.0	60.0	N. E.	30,077	72.0	73.0	62.0	N. E.	30,053	75.5	76.7	63.8	N. E.	30,053	70.3	69.8	58.5	N. E.		
4	30,143	67.5	68.5	61.0	N.	30,098	72.5	72.9	64.0	N. E.	30,031	75.8	74.5	63.5	N.	30,029	71.5	71.0	60.0	N.		
5	30,169	64.5	65.0	58.0	N. sharp.	30,125	68.0	69.3	58.5	N.	30,011	72.0	71.1	58.0	N.	30,012	68.5	67.7	57.0	N.		
6	30,145	63.0	65.0	58.5	N. sharp.	30,099	70.0	70.0	59.5	N.	29,994	74.0	73.5	61.9	N.	29,994	71.5	70.0	58.5	N.		
7	30,118	63.0	65.0	60.0	N. W.	30,085	73.1	73.0	60.5	N.	29,996	78.0	76.7	61.5	N.	29,999	71.5	70.0	58.5	N.		
8	30,132	70.5	72.0	62.0	N.	30,093	77.0	77.0	64.8	N.	30,097	79.8	79.0	61.0	S.	30,001	74.5	73.0	62.9	S.		
9	30,100	71.0	72.0	65.8	S. W.	30,061	78.5	78.0	66.0	S.	30,069	81.0	80.0	66.8	S.	30,069	81.0	80.0	66.8	S.		
10	30,071	70.6	71.4	67.1	S. W.	30,021	74.6	75.4	68.4	N.	30,020	74.8	74.3	67.7	N. W.	30,020	74.8	74.3	67.7	N. W.		
11	30,062	74.0	74.2	67.0	N. W.	30,030	79.4	79.0	66.0	N.	30,034	82.5	82.0	67.2	N. W.	30,034	82.5	82.0	67.2	N. W.		
12	30,031	76.0	77.0	68.4	S. W.	30,090	82.0	82.4	69.0	S.	30,010	85.0	84.0	69.5	S.	30,010	85.0	84.0	69.5	S.		
13	30,024	77.0	78.0	69.8	S.	30,090	82.0	83.4	70.0	S.	30,014	86.0	86.0	71.5	S.	30,014	86.0	86.0	71.5	S.		
14	30,091	79.0	80.0	70.0	S. W.	30,060	83.2	84.0	72.0	S.	30,078	86.0	86.5	71.0	S.	30,078	86.0	86.5	71.0	S.		
15	30,091	79.0	80.0	70.0	S. W.	30,060	83.2	84.0	72.0	S.	30,078	86.0	86.5	71.0	S.	30,078	86.0	86.5	71.0	S.		
16	30,091	79.0	80.0	70.0	S. W.	30,060	83.2	84.0	72.0	S.	30,078	86.0	86.5	71.0	S.	30,078	86.0	86.5	71.0	S.		
17	30,097	73.0	74.0	68.8	N. W.	30,068	73.1	73.1	68.0	N.	30,068	73.1	73.1	68.0	N.	30,068	73.1	73.1	68.0	N.		
18	30,068	71.5	72.8	59.0	N. E.	30,036	76.6	76.8	62.0	N.	30,036	80.0	79.5	64.8	S. W.	30,036	80.0	79.5	64.8	S. W.		
19	30,030	72.0	73.2	62.5	N. E.	30,092	77.5	77.9	62.1	E.	30,089	80.4	79.8	61.5	S. W.	30,089	80.4	79.8	61.5	S. W.		
20	30,008	72.6	73.0	64.0	E.	30,077	73.0	72.5	63.5	E.	30,015	71.8	72.0	63.0	N. E.	30,015	71.8	72.0	63.0	N. E.		
21	30,041	74.0	74.5	64.8	N.	30,000	79.0	79.0	65.2	N.	30,010	81.6	81.0	66.5	N. W.	30,010	81.6	81.0	66.5	N. W.		
22	30,051	72.0	73.0	65.5	N. W.	30,007	78.2	78.8	63.4	N.	30,010	81.6	81.0	66.5	N. W.	30,010	81.6	81.0	66.5	N. W.		
23	30,044	73.5	75.0	65.0	W.	29,980	80.7	80.5	62.0	W.	30,010	81.6	81.0	66.5	N. W.	30,010	81.6	81.0	66.5	N. W.		
24	30,092	73.0	75.0	71.0	S.	30,015	80.8	81.5	72.5	S.	30,015	81.6	81.0	66.5	N. W.	30,015	81.6	81.0	66.5	N. W.		
25	30,044	74.5	75.0	69.8	S.	30,015	80.8	81.5	72.5	S.	30,015	81.6	81.0	66.5	N. W.	30,015	81.6	81.0	66.5	N. W.		
26	30,080	79.0	79.2	72.8	S. W.	30,044	83.2	83.5	74.0	S.	30,049	87.1	86.5	63.8	W.	30,049	87.1	86.5	63.8	W.		
27	30,004	77.0	77.0	72.0	W. S. W.	30,071	82.5	83.5	74.0	S.	30,049	87.1	86.5	63.8	W.	30,049	87.1	86.5	63.8	W.		
28	30,022	82.0	82.5	69.8	S. W.	30,092	86.8	88.0	70.0	S.	30,013	90.8	91.0	72.0	S.	30,013	90.8	91.0	72.0	S.		
29																						
30																						
31																						

These Observations have been made for the most part with a supply of new and first-rate Instruments received into the Observatory, by order of the Bengal Government, a brief description of the Instruments seems necessary. The Barometer by Troughton, used prior to the 1st June 1844, Observations reduced to 32° Fahrenheit = 30.637. The Thermometer, used from 1st June to 1st August 1844, Observations reduced to 32° Fahrenheit = 30.637.

Days of the Month.	Observed at 9 a. 50 m.					Observed at 4 p. m.					Observations made at Sunset.					Rain Gauges.				
	Moan's Phases.					Temperature.					Wind.					Elevation.				
	Barometer reduced to 32° Fahrenheit.	Of the Mer-cury.	Of the Air.	Of wet Bulb.	Direction from Sunrise to 9 h. 50 m.	Barometer reduced to 32° Fahrenheit.	Of the Mer-cury.	Of the Air.	Of wet Bulb.	Direction from 2 h. 40 m. to 4 p. m.	Barometer reduced to 32° Fahrenheit.	Of the Mer-cury.	Of the Air.	Of wet Bulb.	Direction from 4 p. m. to Sunset.	Upper. Feet. 56	Lower. Feet. 4			
1	30.035	80.0	83.2	69.0	W. S. W.	30.003	85.5	86.1	72.0	W.	29.911	89.0	91.1	74.0	W.	29.914	86.0	84.0		
2	30.056	83.0	83.2	71.0	N. ...	30.019	87.0	87.8	64.0	N. W.	29.932	92.5	83.5	64.8	N. W.	29.943	85.0	83.5		
3	30.073	83.0	83.0	62.5	N. W.	30.025	86.5	87.0	63.7	N. ...	29.918	88.4	88.0	64.0	N. W.	29.910	83.0	80.0		
4	30.053	78.8	80.0	61.5	N. ...	30.021	85.4	86.4	72.0	N. ...	29.917	89.0	88.5	64.0	N. W.	29.924	82.0	78.8		
5	30.060	78.0	80.0	68.5	E. ...	30.021	84.2	85.0	64.0	N. E.	29.913	89.0	88.5	64.5	N. W.	29.913	82.0	78.8		
6	30.070	80.0	80.0	70.0	W. S. W.	30.025	86.7	86.9	68.0	W.	29.923	88.6	88.0	70.5	W.	29.900	81.0	78.0		
7	30.077	79.0	79.0	74.9	W. S. W.	30.034	85.0	86.0	70.0	W. S. W.	29.935	88.2	88.0	72.0	N. W.	29.963	83.0	81.0		
8	30.084	76.0	79.2	72.0	S. ...	30.034	85.0	86.0	70.0	W. S. W.	29.934	88.0	88.4	68.0	N. W.	29.908	84.0	81.0		
9	30.085	81.0	82.8	71.0	S. ...	30.021	85.8	86.0	72.0	S. W.	29.921	90.0	89.0	73.9	S.	29.907	83.0	82.9		
10	30.082	81.0	82.8	74.0	S. ...	30.022	87.0	88.1	72.0	S. ...	29.914	90.0	89.0	73.9	S.	29.908	83.0	82.9		
11	30.080	80.5	81.8	70.0	N. W.	30.031	86.0	87.0	76.0	S. ...	29.922	87.0	87.0	69.1	S. ...	29.914	82.8	81.8		
12	30.080	80.5	81.8	70.0	N. W.	30.031	86.0	87.0	76.0	S. ...	29.922	87.0	87.0	69.1	S. ...	29.914	82.8	81.8		
13	30.080	80.5	81.8	70.0	N. W.	30.031	86.0	87.0	76.0	S. ...	29.922	87.0	87.0	69.1	S. ...	29.914	82.8	81.8		
14	30.084	83.2	83.8	71.0	E. ...	30.022	89.0	88.5	71.8	N. ...	29.927	91.5	91.6	68.2	N. ...	29.936	88.0	84.0		
15	30.087	83.5	83.5	76.5	N. W.	30.025	89.5	90.0	74.9	W. ...	29.931	94.0	93.0	69.8	N. W.	29.926	88.0	84.0		
16	30.084	82.2	83.5	74.8	E. ...	30.025	89.5	90.0	74.9	W. ...	29.931	94.0	93.0	69.8	N. W.	29.926	88.0	84.0		
17	30.084	82.2	83.5	74.8	E. ...	30.025	89.5	90.0	74.9	W. ...	29.931	94.0	93.0	69.8	N. W.	29.926	88.0	84.0		
18	30.084	82.2	83.5	74.8	E. ...	30.025	89.5	90.0	74.9	W. ...	29.931	94.0	93.0	69.8	N. W.	29.926	88.0	84.0		
19	30.081	83.8	84.5	75.0	N. W.	30.025	89.5	90.0	74.9	W. ...	29.931	94.0	93.0	69.8	N. W.	29.926	88.0	84.0		
20	30.083	85.4	86.7	77.0	S. E.	30.025	91.9	93.0	73.0	S. ...	29.939	95.9	92.0	70.0	S. ...	29.947	90.9	88.0		
21	30.083	85.4	86.7	77.0	S. E.	30.025	91.9	93.0	73.0	S. ...	29.939	95.9	92.0	70.0	S. ...	29.947	90.9	88.0		
22	30.083	85.4	86.7	77.0	S. E.	30.025	91.9	93.0	73.0	S. ...	29.939	95.9	92.0	70.0	S. ...	29.947	90.9	88.0		
23	30.083	85.4	86.7	77.0	S. E.	30.025	91.9	93.0	73.0	S. ...	29.939	95.9	92.0	70.0	S. ...	29.947	90.9	88.0		
24	30.083	85.4	86.7	77.0	S. E.	30.025	91.9	93.0	73.0	S. ...	29.939	95.9	92.0	70.0	S. ...	29.947	90.9	88.0		
25	30.083	85.4	86.7	77.0	S. E.	30.025	91.9	93.0	73.0	S. ...	29.939	95.9	92.0	70.0	S. ...	29.947	90.9	88.0		
26	30.083	85.4	86.7	77.0	S. E.	30.025	91.9	93.0	73.0	S. ...	29.939	95.9	92.0	70.0	S. ...	29.947	90.9	88.0		
27	30.083	85.4	86.7	77.0	S. E.	30.025	91.9	93.0	73.0	S. ...	29.939	95.9	92.0	70.0	S. ...	29.947	90.9	88.0		
28	30.083	85.4	86.7	77.0	S. E.	30.025	91.9	93.0	73.0	S. ...	29.939	95.9	92.0	70.0	S. ...	29.947	90.9	88.0		
29	30.083	85.4	86.7	77.0	S. E.	30.025	91.9	93.0	73.0	S. ...	29.939	95.9	92.0	70.0	S. ...	29.947	90.9	88.0		
30	30.083	85.4	86.7	77.0	S. E.	30.025	91.9	93.0	73.0	S. ...	29.939	95.9	92.0	70.0	S. ...	29.947	90.9	88.0		
31	30.083	85.4	86.7	77.0	S. E.	30.025	91.9	93.0	73.0	S. ...	29.939	95.9	92.0	70.0	S. ...	29.947	90.9	88.0		

These Observations have been made for the most part with a supply of new and first-rate Instruments, received by Order of the Bengal Government, a brief description of the Instruments seems necessary.

Barometer, by Troughton, used prior to the 1st June 1844, Observations reduced to 32° Fahr. = 29.793
 " by Col. Everest, used from 1st June to 31st August 1844, = 29.817
 " Standard Barometer by Newmann, used from 1st Sept. 1844, = 29.854

Moon's Phases.	Observed at 9 H. 50 M.						Observed at 2 P. M.						Observations made at Sunset.				Rain Gauges.	
	Temperature.			Wind.			Temperature.			Wind.			Temperature.		Wind.		Elevation.	
	Of the Mer.	Of the Air.	Of the Wet Bulb.	Direction	From 9 h. 50 m.	Barometer reduced to 32° Fahr.	Of the Mer.	Of the Air.	Of the Wet Bulb.	Direction	From 2 h. 40 m.	Barometer reduced to 32° Fahr.	Of the Mer.	Of the Air.	Of the Wet Bulb.	Direction	Upper.	Lower.
1	Inches					29	Inches					29	Inches				Feet.	Feet.
2	29.854	86.7	86.8	78.2	S. high.	29.862	87.0	86.0	79.9	S.	from 2 h. 40 m.	29.777	84.0	84.0	78.0	S.	40	4
3	29.890	88.0	87.5	80.0	S. high.	29.882	89.5	89.0	80.2	S.	from 2 h. 40 m.	29.833	85.5	85.5	79.0	S.		
4	29.916	89.0	88.0	81.0	S. high.	29.925	90.0	89.0	81.0	S.	from 2 h. 40 m.	29.868	86.5	86.5	80.0	S.		
5	29.940	88.5	87.7	79.4	S. W.	29.945	92.4	92.0	82.0	N. E.	from 2 h. 40 m.	29.888	87.5	87.5	81.0	N. E.		
6	29.975	88.5	88.0	80.5	S.	29.988	92.4	92.0	82.0	S.	from 2 h. 40 m.	29.918	89.0	89.0	81.0	S.		
7	29.985	89.5	89.0	82.0	S. high.	29.990	94.5	94.0	84.0	S.	from 2 h. 40 m.	29.970	91.0	91.0	84.0	S.		
8	29.985	89.5	89.0	82.0	S. high.	29.990	94.5	94.0	84.0	S.	from 2 h. 40 m.	29.970	91.0	91.0	84.0	S.		
9	29.985	89.5	89.0	82.0	S. high.	29.990	94.5	94.0	84.0	S.	from 2 h. 40 m.	29.970	91.0	91.0	84.0	S.		
10	29.985	89.5	89.0	82.0	S. high.	29.990	94.5	94.0	84.0	S.	from 2 h. 40 m.	29.970	91.0	91.0	84.0	S.		
11	29.985	89.5	89.0	82.0	S. high.	29.990	94.5	94.0	84.0	S.	from 2 h. 40 m.	29.970	91.0	91.0	84.0	S.		
12	29.985	89.5	89.0	82.0	S. high.	29.990	94.5	94.0	84.0	S.	from 2 h. 40 m.	29.970	91.0	91.0	84.0	S.		
13	29.985	89.5	89.0	82.0	S. high.	29.990	94.5	94.0	84.0	S.	from 2 h. 40 m.	29.970	91.0	91.0	84.0	S.		
14	29.985	89.5	89.0	82.0	S. high.	29.990	94.5	94.0	84.0	S.	from 2 h. 40 m.	29.970	91.0	91.0	84.0	S.		
15	29.985	89.5	89.0	82.0	S. high.	29.990	94.5	94.0	84.0	S.	from 2 h. 40 m.	29.970	91.0	91.0	84.0	S.		
16	29.985	89.5	89.0	82.0	S. high.	29.990	94.5	94.0	84.0	S.	from 2 h. 40 m.	29.970	91.0	91.0	84.0	S.		
17	29.985	89.5	89.0	82.0	S. high.	29.990	94.5	94.0	84.0	S.	from 2 h. 40 m.	29.970	91.0	91.0	84.0	S.		
18	29.985	89.5	89.0	82.0	S. high.	29.990	94.5	94.0	84.0	S.	from 2 h. 40 m.	29.970	91.0	91.0	84.0	S.		
19	29.985	89.5	89.0	82.0	S. high.	29.990	94.5	94.0	84.0	S.	from 2 h. 40 m.	29.970	91.0	91.0	84.0	S.		
20	29.985	89.5	89.0	82.0	S. high.	29.990	94.5	94.0	84.0	S.	from 2 h. 40 m.	29.970	91.0	91.0	84.0	S.		
21	29.985	89.5	89.0	82.0	S. high.	29.990	94.5	94.0	84.0	S.	from 2 h. 40 m.	29.970	91.0	91.0	84.0	S.		
22	29.985	89.5	89.0	82.0	S. high.	29.990	94.5	94.0	84.0	S.	from 2 h. 40 m.	29.970	91.0	91.0	84.0	S.		
23	29.985	89.5	89.0	82.0	S. high.	29.990	94.5	94.0	84.0	S.	from 2 h. 40 m.	29.970	91.0	91.0	84.0	S.		
24	29.985	89.5	89.0	82.0	S. high.	29.990	94.5	94.0	84.0	S.	from 2 h. 40 m.	29.970	91.0	91.0	84.0	S.		
25	29.985	89.5	89.0	82.0	S. high.	29.990	94.5	94.0	84.0	S.	from 2 h. 40 m.	29.970	91.0	91.0	84.0	S.		
26	29.985	89.5	89.0	82.0	S. high.	29.990	94.5	94.0	84.0	S.	from 2 h. 40 m.	29.970	91.0	91.0	84.0	S.		
27	29.985	89.5	89.0	82.0	S. high.	29.990	94.5	94.0	84.0	S.	from 2 h. 40 m.	29.970	91.0	91.0	84.0	S.		
28	29.985	89.5	89.0	82.0	S. high.	29.990	94.5	94.0	84.0	S.	from 2 h. 40 m.	29.970	91.0	91.0	84.0	S.		
29	29.985	89.5	89.0	82.0	S. high.	29.990	94.5	94.0	84.0	S.	from 2 h. 40 m.	29.970	91.0	91.0	84.0	S.		
30	29.985	89.5	89.0	82.0	S. high.	29.990	94.5	94.0	84.0	S.	from 2 h. 40 m.	29.970	91.0	91.0	84.0	S.		

Moon & Phases.										Observed at 9 a. 50 m.					Observed at Apparent Noon.					Observed at 4 p. m.					Observations made at Sunset.					Main Gauges.	
Barometer reduced to 32° Fahrenheit.		Temperature.		Wind.	Barometer reduced to 32° Fahrenheit.		Temperature.		Wind.	Barometer reduced to 32° Fahrenheit.		Temperature.		Wind.	Barometer reduced to 32° Fahrenheit.		Temperature.		Wind.	Barometer reduced to 32° Fahrenheit.		Temperature.		Wind.	Elevation.		Feet.	Feet.			
Inches.	Of the Mer-cury.	Of the Air.	Of the Bulb.	Direction from Sunrise to 9 h. 50 m.	Inches.	Of the Mer-cury.	Of the Air.	Of the Bulb.	Direction from 9 h. 50 m. to Noon.	Inches.	Of the Mer-cury.	Of the Air.	Of the Bulb.	Direction from 2 h. 40 m. to 4 p. m.	Inches.	Of the Mer-cury.	Of the Air.	Of the Bulb.	Direction from 4 p. m. to sunset.	Inches.	Of the Mer-cury.	Of the Air.	Of the Bulb.	Direction from 4 p. m. to sunset.	Upper.	Lower.	4				
29.836	88.0	87.1	81.0	S.	29.835	92.0	91.0	82.0	S.	29.795	94.0	92.2	80.3	S.	29.734	88.0	87.5	79.5	S.	29.734	88.0	87.5	79.5	S.	3.19	0.67	1.63	0.39			
814	88.5	87.0	79.0	S.	783	79.8	79.8	79.8	S.	725	74.5	74.9	72.0	S.	710	74.0	74.0	72.5	S. E.	710	74.0	74.0	72.5	S. E.	0.64	0.67	1.63	0.39			
814	88.5	86.0	72.1	S. E.	806	91.0	90.8	82.0	S.	738	91.0	91.0	7.98	S.	733	85.5	85.3	79.4	S.	733	85.5	85.3	79.4	S.	0.64	0.67	1.63	0.39			
760	90.9	90.5	83.8	S.	725	92.8	92.7	83.2	S. high.	648	93.0	92.0	81.9	S.	677	87.0	86.9	80.0	S. E.	677	87.0	86.9	80.0	S. E.	0.64	0.67	1.63	0.39			
778	90.0	89.7	82.5	S.	751	94.0	93.5	81.5	S.	657	96.2	96.2	83.3	S.	683	90.0	89.9	82.4	S. E.	683	90.0	89.9	82.4	S. E.	0.64	0.67	1.63	0.39			
812	91.6	91.0	82.8	S.	769	96.5	96.0	83.4	S. E.	670	96.2	94.2	84.0	S.	687	90.0	89.0	81.0	S.	687	90.0	89.0	81.0	S.	0.64	0.67	1.63	0.39			
808	93.0	91.0	80.4	S. E.	760	96.0	95.0	83.0	S.	661	96.4	96.0	86.0	S.	680	90.4	89.0	80.0	S.	680	90.4	89.0	80.0	S.	0.64	0.67	1.63	0.39			
749	91.5	91.0	83.0	S.	733	94.0	94.0	81.2	S.	643	97.0	95.0	80.4	S.	653	89.0	89.0	88.0	S.	653	89.0	89.0	88.0	S.	0.64	0.67	1.63	0.39			
671	92.0	91.5	82.8	S.	636	97.0	96.0	82.5	S.	608	97.0	94.2	81.0	S. E.	610	90.0	89.0	79.5	S.	610	90.0	89.0	79.5	S.	0.64	0.67	1.63	0.39			
642	94.0	92.5	83.0	S.	621	97.0	97.0	85.9	S.	525	96.7	95.0	84.5	S.	560	92.0	91.0	80.5	S.	560	92.0	91.0	80.5	S.	0.64	0.67	1.63	0.39			
761	91.0	89.5	80.0	S.	731	96.0	93.1	80.0	S.	653	97.5	94.2	81.0	S.	706	84.6	84.5	73.8	S.	706	84.6	84.5	73.8	S.	0.64	0.67	1.63	0.39			
813	93.0	92.0	82.9	S.	776	96.1	95.8	83.0	S.	649	96.4	95.0	82.0	S.	641	89.0	89.0	79.0	S.	641	89.0	89.0	79.0	S.	0.64	0.67	1.63	0.39			
778	91.0	91.0	83.0	S.	740	94.6	94.0	81.0	S.	633	95.0	93.5	81.0	S.	630	90.0	89.3	80.0	S.	630	90.0	89.3	80.0	S.	0.64	0.67	1.63	0.39			
747	92.0	91.0	82.9	S.	737	94.5	93.5	82.0	S.	619	97.5	94.8	79.8	S.	706	89.5	88.0	79.0	S. E.	706	89.5	88.0	79.0	S. E.	0.64	0.67	1.63	0.39			
819	93.8	93.0	80.4	E.	799	91.4	91.5	77.8	S.	689	96.0	92.5	80.0	S.	709	88.5	88.0	78.0	S.	709	88.5	88.0	78.0	S.	0.64	0.67	1.63	0.39			
823	92.8	89.4	83.0	S.	805	95.0	94.5	82.5	S.	708	95.8	92.5	80.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
783	92.0	91.5	84.0	S.	805	94.0	93.2	83.0	S.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.	0.64	0.67	1.63	0.39			
694	91.2	90.9	83.0	S.	744	94.0	92.5	82.8	S. high.	629	95.8	90.5	82.0	S.	645	89.5	89.0	79.0	S.	645	89.5	89.0	79.0	S.							

[illegible]

Days of week and months.	Observed at 9 h. 50 m.				Observed at Noon.				Observed at 4 P. M.				Observations made at Sunset.				Rain Gauges.	
	Temperature.				Temperature.				Temperature.				Temperature.				Elevation.	
	Barometer reduced to 32° Fahrenheit.	Of the Mer-cury.	Of the Air.	Of wet Bulb.	Direction from Sun to 9 h. 50 m.	Barometer reduced to 32° Fahrenheit.	Of the Mer-cury.	Of the Air.	Of wet Bulb.	Direction from 2 h. 40 m. to 4 p. m.	Barometer reduced to 32° Fahrenheit.	Of the Mer-cury.	Of the Air.	Of wet Bulb.	Direction from 4 p. m. to Sunset.	Upper.	Feet.	Lower.
1	29.554	84.8	84.0	80.8	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
2	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
3	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
4	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
5	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
6	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
7	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
8	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
9	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
10	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
11	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
12	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
13	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
14	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
15	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
16	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
17	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
18	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
19	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
20	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
21	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
22	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
23	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
24	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
25	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
26	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
27	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
28	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
29	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
30	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	
31	29.554	86.0	86.0	81.5	S. E.	29.520	91.4	88.5	81.0	S. E.	29.436	88.0	85.0	80.0	S. E.	1.37	1.50	

These Observations have been made for the most part with a supply of new and first-rate Instruments received from the Observatory, by order of the Bengal Government, a brief description of the Instruments seems necessary.

Barometer by Troughton, used prior to the 1st June 1844. Observations reduced to 32° Fahr. = 29.493

No. 81. Standard Barometer by Airy, used from 1st June to 31st August 1844. Ditto = 29.493

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of March, 1845

Rain Gauge.		Elevation.		Observations made at Sunset.				Observations made at Apparent Noon.				Observed at 9 A. M.				Moon's Phases.			
Feet.	Feet.	Wind.	Of Wet Bulb.	Of the Air.	Of the Mer- cury.	Barometer reduced to 32° Fahrenheit.	Wind.	Of Wet Bulb.	Of the Air.	Of the Mer- cury.	Barometer reduced to 32° Fahrenheit.	Wind.	Of Wet Bulb.	Of the Air.	Of the Mer- cury.	Barometer reduced to 32° Fahrenheit.	Wind.	Of Wet Bulb.	Of the Air.
Upper.	Lower.	Direction from 4 p. m. to Sunset.					Direction from 9 h. 50 m. to Noon.					Direction from Sunrise to 9 h. 50 m.							
Inches.	Inches.																		
...	...	S. W.	78.5	83.5	83.8	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9	29.667	S. E.	78.2	87.4	87.3	29.659	S. E.	78.2	85.0	85.2	29.788	S. W.	75.9	81.5
...	...	S. W.	70.2	83.5	86.9														

These Observations have been made for the most part with a supply of new and first-rate Instruments, received into the Observatory, by orders of the Bengal Government, a brief description of the Instruments seems necessary.

Barometer by Troughton, used prior to the 1st June 1844, Observations reduced to 32° Fahr. =	29,493	34
by Col. Everest, used from 1st June to 31st August 1844, ... Ditto ... =	29,637	7
No. 52, Standard Barometer by Newman, used from 1st Sept. 1844, ... Ditto ... =	29,654	4
No. 86, Ditto Ditto Ditto from 3rd April 1847, ... Ditto ... =	29,667	7

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of April, 1864.

Days of the Month.	Observed at 9 H. 50 M.						Observed at Apparent Noon.						Observed at 4 P. M.						Observations made at Sunset.						Rain Gauges.	
	Moon's Phases.			Barometer reduced to 32° Fahrenheit.			Barometer reduced to 32° Fahrenheit.			Barometer reduced to 32° Fahrenheit.			Barometer reduced to 32° Fahrenheit.			Barometer reduced to 32° Fahrenheit.			Barometer reduced to 32° Fahrenheit.			Barometer reduced to 32° Fahrenheit.			Elevation.	
	Of the Mer- cury.	Of the Air.	Of Wet Bulb.	Direction from Sunrise to 9 h. 50 m.	Of the Mer- cury.	Of the Air.	Of Wet Bulb.	Direction from 9 h. 50 m. to Noon.	Of the Mer- cury.	Of the Air.	Of Wet Bulb.	Direction from 2 h. 40 m. to 4 p. m.	Of the Mer- cury.	Of the Air.	Of Wet Bulb.	Direction from 4 p. m. to Sunset.	Upper.	Lower.	Feet. 40	Feet. 4						
1.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
2.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
3.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
4.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
5.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
6.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
7.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
8.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
9.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
10.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
11.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
12.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
13.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
14.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
15.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
16.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
17.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
18.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
19.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
20.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
21.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
22.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
23.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
24.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
25.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
26.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
27.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
28.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
29.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
30.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
31.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	
Mean.	29.854	82.0	76.2	N. W.	29.854	81.8	75.9	S. E.	29.734	80.8	76.9	S. W.	29.735	84.4	84.3	76.2	S. E.	0.88	0.99	29.639	86.4	87.6	79.5	1.12	1.31	

These Observations have been made for the most part with a supply of new and first rate Instruments received into the Observatory, by orders of the Bengal Government, a brief description of the Instruments sent necessary.

Barometer by Troughton, used prior to the 1st June 1844, Observations reduced to 32° Fah. = 29.493
 " by Col. Everest, used from 1st June to 31st August 1844, " = 29.637
 No. 52, Standard Barometer by Newman, used from 1st Sept. 1844, " = 29.654
 " by 2nd April 1847, " = 29.667

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of May, 1848.

Observed at 9 H. 50 M.										Observations made at Apparent Noon.										Observed at 4 P. M.										Observations made at Sunset.										Rain Gauges.			
Moon's Phases.																																											
Barometer reduced to 32° Fahrenheit.										Barometer reduced to 32° Fahrenheit.										Barometer reduced to 32° Fahrenheit.										Barometer reduced to 32° Fahrenheit.													
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Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of June, 1845.

June.										Observed at 9 h. 50 m.										Observations made at Apparent Noon.										Observed at 4 p. m.										Observations made at Sunset.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
Days of the Month.										Moon's Phases.										Barometer reduced to 32° Fahrenheit.										Barometer reduced to 32° Fahrenheit.										Barometer reduced to 32° Fahrenheit.										Barometer reduced to 32° Fahrenheit.										Barometer reduced to 32° Fahrenheit.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
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These Observations have been made for the most part with a supply of new and first-rate Instrument received into the Observatory, by orders of the Bengal Government, a brief description of the Instruments seen necessary.

Barometer by Troughton, used prior to the 1st June 1844, Observations reduced to 32° Fah. 29.493
 " " Col. Verest, used from 1st June to 31st August 1844, " " " 29.637
 " " Standard Barometer by Newman, used from 1st Sept. 1844, " " " 29.654

meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of July, 1848.

Days of the Month.	Observed at 9 h. 50 m.				Observed at Apparent Noon.				Observed at 4 p. m.				Observations made at Sunset.				Rain Gauges.		
	Barometer reduced to 32° Fahrenheit.	Of the Mer.	Temperature.	Wind.	Barometer reduced to 32° Fahrenheit.	Of the Mer.	Temperature.	Wind.	Barometer reduced to 32° Fahrenheit.	Of the Mer.	Temperature.	Wind.	Barometer reduced to 32° Fahrenheit.	Of the Mer.	Temperature.	Wind.	Elevation.	Feet. 40	Feet. 4
1	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
2	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
3	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
4	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
5	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
6	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
7	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
8	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
9	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
10	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
11	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
12	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
13	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
14	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
15	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
16	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
17	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
18	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
19	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
20	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
21	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
22	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
23	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
24	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
25	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
26	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
27	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
28	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
29	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
30	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
31	29.557	88.3	86.9	S. S. W.	29.515	86.0	85.3	S. S. W.	29.465	88.9	83.5	S. S. W.	29.469	87.2	83.6	S. E.	Upper.	Lower.	...
Mean.	29.575	88.0	86.9	81.8	29.551	89.5	86.4	89.0	29.481	88.2	87.1	81.4	29.495	84.8	84.6	80.7	16.00	17.50	...

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of August, 1848.

Moon's Phases.	Observed at 9 H. 50 M.						Observed at 4 P. M.						Observations made at Sunset.						Rain Gauges.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
	Temperature.			Wind.	Barometer reduced to 32° Fahrenheit.	Of the Mer.	Temperature.		Wind.	Barometer reduced to 32° Fahrenheit.	Of the Mer.	Temperature.		Wind.	Barometer reduced to 32° Fahrenheit.	Of the Mer.	Temperature.		Wind.	Barometer reduced to 32° Fahrenheit.	Of the Mer.	Direction at Sunset.	Elevation.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
	Of the Mer.	Of the Air.	Of Wet Bulb.	Direction at 9 H. 50 M.			Of the Air.	Of Wet Bulb.	Direction at 4 P. M.			Of the Air.	Of Wet Bulb.	Direction at Sunset.			Of the Air.	Of Wet Bulb.	Direction at Sunset.					Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	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Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	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Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.	Of the Air.	Of Wet Bulb.	Direction at Sunset.

Those Observations have been made for the most part with a supply of new and first-rate Instruments, received into the Observatory, by orders of the Bengal Government, a brief description of the Instruments seems necessary.

Barometer by Troughton, used prior to the 1st June 1844. Observations reduced to 32° Fahr.

By Col. Everest, used from 1st June to 31st August 1844.

By Col. Everest, used from 1st Sept. 1844.

Barometer by Newmann, used from 1st Sept. 1844.

Ditto from 3rd April 1847.

Ditto

Ditto

No. 86, standard Barometer, used from 1st Sept. 1844.

No. 85, standard Barometer, used from 1st Sept. 1844.

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of September, 1845.

Days of the Month.	Observed at 9 a. m. 50 m.						Observed at 4 p. m.						Observations made at Sunset.				Rain Gauges.	
	Temperature.			Wind.			Temperature.			Wind.			Temperature.		Direction at Sunset.	Wind.	Elevation.	
	Of the Mer.	Of the Air.	Of Wet Bulb.	at 9 h 50 m.	Direction.	Barometer reduced to 32° Fahrenheit.	Of the Mer.	Of the Air.	Of Wet Bulb.	at 4 p. m.	Direction.	Barometer reduced to 32° Fahrenheit.	Of the Mer.	Of the Air.			Feet.	Inches.
1	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
2	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
3	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
4	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
5	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
6	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
7	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
8	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
9	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
10	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
11	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
12	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
13	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
14	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
15	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
16	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
17	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
18	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
19	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
20	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
21	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
22	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
23	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
24	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
25	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
26	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
27	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
28	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
29	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
30	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08
Mean.	83.2	81.2	81.2	81.2	S. W.	29.554	90.1	88.3	81.0	S. W.	S. W.	29.571	85.9	84.3	S.	81.2	0.05	0.08

These Observations have been made for the most part with a supply of new and first-rate instruments received into the Observatory, by orders of the Bengal Government, a brief description of the instruments seems necessary.

Days of the Month.	Observed at 9 a.m.					Observed at Apparent Noon.					Observed at 4 p.m.					Observations made at Sunset.					Rain Gauges.
	Barometer reduced to 32° Fahrenheit.	Temperature.		Wind.	Direction at 9 h. 50 m.	Barometer reduced to 32° Fahrenheit.	Temperature.		Wind.	Direction at Noon.	Barometer reduced to 32° Fahrenheit.	Temperature.		Wind.	Direction at 4 p.m.	Barometer reduced to 32° Fahrenheit.	Temperature.		Wind.	Direction at Sunset.	
		Of the Air.	Of the Mer.				Of the Air.	Of the Mer.				Of the Air.	Of the Mer.				Of the Air.	Of the Mer.			
Mean.	30.338	84.3	83.5	76.8	...	29.892	86.6	85.4	76.8	...	29.835	87.6	85.9	75.7	...	29.838	84.0	83.1	76.0	...	5.18
1	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
2	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
3	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
4	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
5	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
6	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
7	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
8	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
9	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
10	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
11	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
12	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
13	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
14	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
15	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
16	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
17	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
18	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
19	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
20	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
21	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
22	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
23	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
24	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
25	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
26	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
27	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
28	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
29	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
30	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
31	30.731	79.3	79.4	78.3	...	30.700	83.8	82.6	80.1	...	29.856	84.1	83.9	76.6	...	29.638	81.7	81.5	78.9	...	...
Mean.	30.338	84.3	83.5	76.8	...	29.892	86.6	85.4	76.8	...	29.835	87.6	85.9	75.7	...	29.838	84.0	83.1	76.0	...	5.18

These Observations have been made for the most part with a supply of new and first-rate instruments, into the Observatory, by orders of the Bengal Government, a brief description of the instruments is deemed necessary. Barometer by Troughton, used prior to the 1st June 1844. Observations reduced to 32° Fahr. 29.493 by Col. Everest, used from 1st June to 31st August 1844. Ditto 29.527 29.554

November.
Days of the Month.

Observed at 9 h 50 m.

Observed at Apparent Noon

Observed at 4 P M

Observations made at Sunset.

Rain Gauges.

Days of the Month.	Observed at 9 h 50 m.					Observed at Apparent Noon					Observed at 4 P M					Observations made at Sunset.					Rain Gauges.	
	Temperature		Wind		Barometer reduced to 32° Fahrenheit	Temperature		Wind		Barometer reduced to 32° Fahrenheit	Temperature.		Wind.		Temperature.		Wind.		Inches	Feet. 40	Feet. 4	
	Of the Mer.	Of the Air.	Of Wet Bulb	Direction at 9 h 50 m		Of the Mer.	Of the Air.	Of Wet Bulb	Direction at Noon		Of the Mer.	Of the Air.	Of Wet Bulb	Direction at Sunset.	Of the Mer.	Of the Air.	Of Wet Bulb.	Direction at Sunset.				
1	79.3	75.4	75.4	N. N. W.	29.961	83.9	82.5	76.6	N. N. W.	29.893	84.0	83.3	75.2	N. N. W.	39.909	85.0	81.2	0	74.9	73.7	71.9	
2	83.0	82.9	82.9	N. N. E.	29.974	87.4	86.5	74.7	N. E.	29.912	89.0	88.7	72.6	Ditto.	39.935	88.5	83.5	0	81.8	80.8	79.8	
3	83.8	83.7	83.7	N. E. S.	29.971	86.0	86.5	74.7	N. E.	29.907	87.4	86.5	72.8	Ditto.	39.920	88.3	83.3	0	81.2	80.2	79.2	
4	83.8	83.7	83.7	N. E. S.	29.971	86.0	86.5	74.7	N. E.	29.907	87.4	86.5	72.8	Ditto.	39.920	88.3	83.3	0	81.2	80.2	79.2	
5	82.0	81.9	81.9	N. N. E.	29.955	86.3	85.5	73.5	N. N. W.	29.889	87.4	86.5	72.3	N. N. W.	39.909	85.0	81.2	0	81.2	80.2	79.2	
6	80.4	80.3	80.3	N. N. E.	29.942	85.3	84.5	72.9	N. N. W.	29.876	86.3	85.5	72.3	N. N. W.	39.909	85.0	81.2	0	81.2	80.2	79.2	
7	78.4	78.3	78.3	N. N. W.	29.931	84.4	83.6	72.3	N. N. W.	29.865	85.3	84.5	70.1	N. N. W.	39.909	85.0	81.2	0	81.2	80.2	79.2	
8	79.3	79.7	79.7	N. N. W.	29.945	83.7	83.0	72.3	N. N. W.	29.876	84.4	83.6	70.1	N. N. W.	39.909	85.0	81.2	0	81.2	80.2	79.2	
9	83.4	83.4	83.4	N. N. W.	29.951	89.5	89.5	78.5	N. N. W.	29.882	90.5	90.5	77.3	N. N. W.	39.909	85.0	81.2	0	81.2	80.2	79.2	
10	83.4	83.4	83.4	N. N. W.	29.951	89.5	89.5	78.5	N. N. W.	29.882	90.5	90.5	77.3	N. N. W.	39.909	85.0	81.2	0	81.2	80.2	79.2	
11	77.4	76.4	76.4	N. N. W.	29.929	81.3	80.8	68.7	N. N. W.	29.860	82.3	81.3	67.2	Ditto.	39.909	85.0	81.2	0	81.2	80.2	79.2	
12	77.4	76.4	76.4	N. N. W.	29.929	81.3	80.8	68.7	N. N. W.	29.860	82.3	81.3	67.2	Ditto.	39.909	85.0	81.2	0	81.2	80.2	79.2	
13	77.4	76.4	76.4	N. N. W.	29.945	82.3	80.4	68.8	N. N. W.	29.876	83.3	81.3	68.8	Ditto.	39.909	85.0	81.2	0	81.2	80.2	79.2	
14	77.4	76.4	76.4	N. N. W.	29.945	82.3	80.4	68.8	N. N. W.	29.876	83.3	81.3	68.8	Ditto.	39.909	85.0	81.2	0	81.2	80.2	79.2	
15	77.4	76.4	76.4	N. N. W.	29.945	82.3	80.4	68.8	N. N. W.	29.876	83.3	81.3	68.8	Ditto.	39.909	85.0	81.2	0	81.2	80.2	79.2	
16	77.4	76.4	76.4	N. N. W.	29.945	82.3	80.4	68.8	N. N. W.	29.876	83.3	81.3	68.8	Ditto.	39.909	85.0	81.2	0	81.2	80.2	79.2	
17	77.4	76.4	76.4	N. N. W.	29.945	82.3	80.4	68.8	N. N. W.	29.876	83.3	81.3	68.8	Ditto.	39.909	85.0	81.2	0	81.2	80.2	79.2	
18	77.4	76.4	76.4	N. N. W.	29.945	82.3	80.4	68.8	N. N. W.	29.876	83.3	81.3	68.8	Ditto.	39.909	85.0	81.2	0	81.2	80.2	79.2	
19	77.4	76.4	76.4	N. N. W.	29.945	82.3	80.4	68.8	N. N. W.	29.876	83.3	81.3	68.8	Ditto.	39.909	85.0	81.2	0	81.2	80.2	79.2	
20	77.4	76.4	76.4	N. N. W.	29.945	82.3	80.4	68.8	N. N. W.	29.876	83.3	81.3	68.8	Ditto.	39.909	85.0	81.2	0	81.2	80.2	79.2	
21	77.4	76.4	76.4	N. N. W.	29.945	82.3	80.4	68.8	N. N. W.	29.876	83.3	81.3	68.8	Ditto.	39.909	85.0	81.2	0	81.2	80.2	79.2	
22	77.4	76.4	76.4	N. N. W.	29.945	82.3	80.4	68.8	N. N. W.	29.876	83.3	81.3	68.8	Ditto.	39.909	85.0	81.2	0	81.2	80.2	79.2	
23	77.4	76.4	76.4	N. N. W.	29.945	82.3	80.4	68.8	N. N. W.	29.876	83.3	81.3	68.8	Ditto.	39.909	85.0	81.2	0	81.2	80.2	79.2	
24	77.4	76.4	76.4	N. N. W.	29.945	82.3	80.4	68.8	N. N. W.	29.876	83.3	81.3	68.8	Ditto.	39.909	85.0	81.2	0	81.2	80.2	79.2	
25	77.4	76.4	76.4	N. N. W.	29.945	82.3	80.4	68.8	N. N. W.	29.876	83.3	81.3	68.8	Ditto.	39.909	85.0	81.2	0	81.2	80.2	79.2	
26	77.4	76.4	76.4	N. N. W.	29.945	82.3	80.4	68.8	N. N. W.	29.876	83.3	81.3	68.8	Ditto.	39.909	85.0	81.2	0	81.2	80.2	79.2	
27	77.4	76.4	76.4	N. N. W.	29.945	82.3	80.4	68.8	N. N. W.	29.876	83.3	81.3	68.8	Ditto.	39.909	85.0	81.2	0	81.2	80.2	79.2	
28	77.4	76.4	76.4	N. N. W.	29.945	82.3	80.4	68.8	N. N. W.	29.876	83.3	81.3	68.8	Ditto.	39.909	85.0	81.2	0	81.2	80.2	79.2	
29	77.4	76.4	76.4	N. N. W.	29.945	82.3	80.4	68.8	N. N. W.	29.876	83.3	81.3	68.8	Ditto.	39.909	85.0	81.2	0	81.2	80.2	79.2	
30	77.4	76.4	76.4	N. N. W.	29.945	82.3	80.4	68.8	N. N. W.	29.876	83.3	81.3	68.8	Ditto.	39.909	85.0	81.2	0	81.2	80.2	79.2	
Mean	78.9	77.9	78.9		30.012	82.3	81.5	70.1		29.948	83.1	81.4	69.3		39.953	79.5	78.4		89.4			
Mean of the day	77.6	77.5	77.5		30.008	81.9	80.4	70.1		29.997	81.5	80.1	69.3		39.900	78.5	77.4		89.4			

These Observations have been made for the most part with a supply of new and first class Instruments receive into the Observatory by order of the Bengal Government, brief description of the Instruments seems necessary.

Barometer by Troughton used prior to the 1st June 1864. Observations referred to 32° Fahr = 90° F.

[illegible]

